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Edition : 2006-04-07

Publication no.

599 37 81-54

EN

**Washing machines with
EWM 1000 electronic
control system:**

for ARCHED cabinet

**Technical and functional
characteristics**

**Version with
Vertical buttons**

**Production:
ZP – Porcia - Italy
PLT – Olawa - Poland**

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1 Purpose of this manual

The purpose of this manual is to provide service engineers who are already familiar with the repair procedures for traditional washing machines with information regarding appliances fitted with the EWM 1000 electronic control system and produced in Porcia (Italy) and Olawa (Poland).

The following are described:

- general characteristics
- control panel and washing programmes
- technical and functional characteristics
- access to the electronic control system

For detailed information concerning diagnostics and alarms, refer to the following manual:

“EWM1000 electronic control system: guide to diagnostics procedures”.

2 GENERAL CHARACTERISTICS

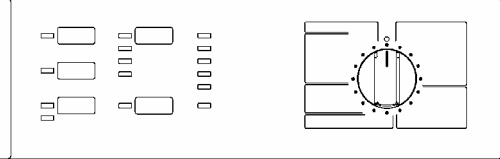
The EWM 1000 electronic control system consists of a single PCB, which incorporates the power, control and display functions.

The PCB is contained in a protective casing located behind the control panel support. Two basic versions of the PCB are produced: one with horizontal pushbuttons and one with vertical pushbuttons.



The EWM 1000 electronic control system may be fitted to the following appliances:

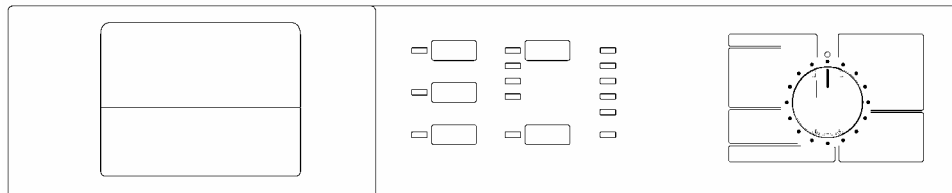
- ◆ front-loading washing machines manufactured in Italy (Porcia) **(ZP)**
- ◆ front-loading washing machines manufactured in Olawa (Poland) **(PLT)**

	
Number of buttons	<ul style="list-style-type: none"> max. 5 (4 options + start/pause)
Number of LEDs	<ul style="list-style-type: none"> max. 15 for version with vertical pushbuttons
Programme selector	<ul style="list-style-type: none"> 16 positions with main switch (incorporated in the PCB)
Buzzer	<ul style="list-style-type: none"> incorporated in the PCB
Serial port	<ul style="list-style-type: none"> DAAS-EAP communications protocol up to 38400 baud
Power supply	<ul style="list-style-type: none"> 220/240V 50/60 Hz (configurable)
Type of washing	<ul style="list-style-type: none"> traditional with "eco-ball" sphere
Rinsing system	<ul style="list-style-type: none"> Traditional
Motor	<ul style="list-style-type: none"> Commutator motor
Spin speed	<ul style="list-style-type: none"> 600 - 1600 rpm
Anti-unbalancing system	<ul style="list-style-type: none"> FUCS
Water fill	<ul style="list-style-type: none"> 1 solenoid valve with 1 inlet - 2 outlets
Detergent drawer	<ul style="list-style-type: none"> 3 compartments: prewash/stains, wash, conditioners 4 compartments: prewash/stains, wash, conditioners, bleach
Control of water level in the tub	<ul style="list-style-type: none"> two-level pressure switch: 1st level and anti-boiling safety level (the other levels refer to fixed-time fills) possibility of three-level pressure switch: 1st level, anti-boiling and anti-flooding safety levels
Door safety device	<ul style="list-style-type: none"> Traditional (with PTC) Instantaneous
Power of heating element	<ul style="list-style-type: none"> up to 1950W
Temperature control	<ul style="list-style-type: none"> NTC sensor

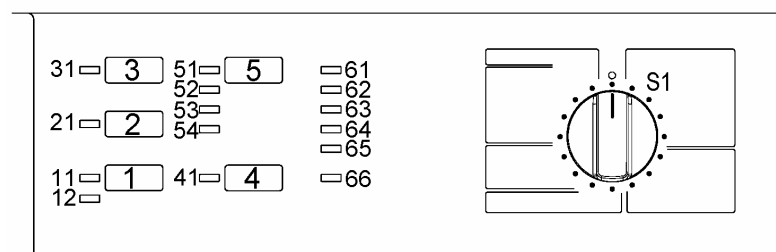
3 CONTROL PANEL

3.1 AEG Styling

- max. 5 pushbuttons
- 16-position programme selector



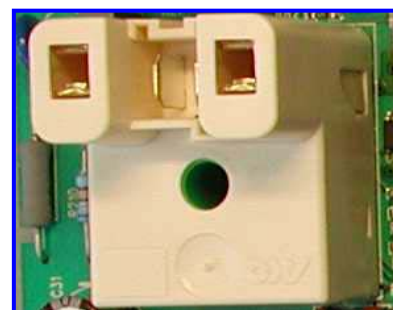
3.2 Configuration of control panel



The washing programmes, the functions of the selector knob and the various pushbuttons vary according to the model, since these are determined by the configuration of the appliance.

3.2.1 Programme selector (S1)

The selector features 16 positions and incorporates the ON/OFF switch. The various positions of the selector may be configured to perform different washing programmes; in the first position, the appliance is switched off and the current programme is cancelled. For each programme, the compatible options and other parameters are defined.



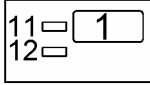
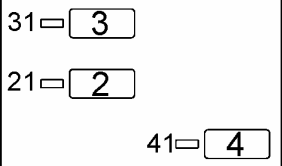

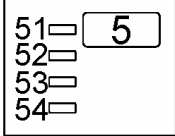
• Programme configuration

The table below lists the parameters that can be used to define the washing programmes.


Types of fabric	Cotton/linen, Synthetic fabrics, Delicates, Wool, Hand-wash, Shoes, Jeans, Duvet
Special programmes	Soak, Rinses, Spin, Drain, Conditioner
Temperature	Normal, Maximum: the initial temperature is the maximum that can be selected for a specific washing programme
Spin	Normal, Minimum, Maximum
Options (Normal / Possible)	Bleach, Economy (energy label), Daily, Stains, Short, Very short, Reduced spin speed, Night-time cycle, Half-load, Easy-Iron, Rinse Hold, Extra rinse, Pre-wash
Programme phases	Pre-wash, Wash, Rinses, Spin, Economy, Delayed start

3.3 Pushbuttons and LEDs

The functions of each button are defined by the configuration of the appliance.

<ul style="list-style-type: none"> • Button 1: This pushbutton is connected to two LEDs (11 – 12) and, if used, may be configured for selection of one or two options; in the latter case, the two options cannot be selected at the same time. 	
<ul style="list-style-type: none"> • Buttons 2, 3, 4: These pushbuttons are connected to LEDs 21, 31 and 41 respectively and, if used, each can be configured for a single option. 	
<ul style="list-style-type: none"> • Button 5:  as a multi-selection button: in this case, the button is connected to LEDs 51, 52, 53, 54 and can be used to select the spin speed and the delayed-start time. 	
<ul style="list-style-type: none"> • Combination of buttons: The appliance can be configured to utilize a combination of two buttons (which must be pressed simultaneously for 5 seconds) to select the super-rinse cycle or to deactivate the buzzer (if featured). A similar procedure is used to access the diagnostics procedure or to select DEMO mode. 	

3.3.1 Wash phase LEDs

<ul style="list-style-type: none"> • Vertical pushbuttons version LEDs 61-65 can be used as wash phase indicators. These, too, can be configured; the END OF CYCLE indicator is featured on all models. LED 66 indicates the status of the door. 	
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Indications	
Pre-wash	Lights during selection mode if the programme includes the pre-wash phase, and during the execution of the pre-wash
Wash	Lights during selection mode if the programme includes the wash phase, and during the execution of the wash
Pre-wash/Wash	Lights during selection mode if the programme includes the pre-wash or wash phases, and during the execution of these phases
Rinses	Lights during selection mode if the programme includes rinse phases, and during the execution of the rinses
Spin	Lights during selection mode if the programme includes the spin phase, and during the execution of the spin
Drain	Lights during selection mode if the programme includes the drain phase, and during the execution of the drain
Extra rinse	Lights when this option has been memorized (if included in the cycle)
Rinse-hold	Lights if the programme includes the rinse-hold option and at the end of the cycle, when the appliance stops with water in the tub
Current cycle	Lights during execution of the cycle
End of cycle	Lights when the programme has been completed; also used to display alarm conditions
ON/OFF	Lights when the appliance is switched on
Door locked	Lights when the door interlock prevents opening of the door, and switches off when the door can be opened. Flashes when the interlock is about to release the door (may be seen if PTC devices are used, as these require one or two minutes before releasing the interlock)

4 WASHING PROGRAMMES AND OPTIONS

4.1 Programmes

The washing programmes can be configured. The basic programmes are listed in the table below.

Programme		Temperature (°C)	Number of rinses	Final spin (rpm)
Cotton	90	82	3	450/650/850/1000/1200/ 1300/1600
	90E	67		
	60	60		
	60E	54 (*)		
	50	50		
	50/40E	43 (*)		
	40	40		
	30	30		
	cold	20		
Synthetic fabrics	60	60	3	Max. 900
	60/50E	42 (*)		
	50	50		
	40	42		
	30	30		
	cold	20		
Mini Programme	30	30	3	Max. 900
	cold	20		
Delicates	40	40	3	450/700
	30	30		
	cold	20		
Wool Hand-wash	40	38	3	Max. 1000
	30	33		
	cold	20		
Shoes	40	40	3	Max. 1000
	30	30		
	cold	20		
Jeans	60	60	5	450/650/850/1000/1200/ 1300/1400
	50	50		
	40	40		
	30	30		
	cold	20		
Soak		30/20	----	----
Rinses		----	3	Max. 1600
Conditioner		----	1	Max. 1600
Drain		----	----	----
Spin		----	----	Max. 1600

The data are indicative.

(*) "energy label" programmes

4.2 Options

The table below lists the possible options for the washing programmes, the compatibility of the various options and with the cycle, and when it is possible to select or modify the options.

The options can be selected in three ways:

- using the programme selector: in this case, the options are configured as special programmes.
- using the secondary selector (temperature or spin speed)
- using the pushbuttons

			OPTIONS													
			Rinse-hold	Night cycle	Pre-wash	Stains	Short (Daily)	Very short	Economy	Super-rinse	Bleach	Half-load	Easy-iron	Reduced spin speed	No spin	Hygienize
Compatibility with PROGRAMMES	Cotton	90°C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		60°C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		50°C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		40°C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		30°C	X	X	X		X	X		X	X	X	X	X	X	X
		cold	X	X	X		X	X		X	X	X	X	X	X	X
	Synthetic fabrics	60°C	X	X	X	X	X	X	X	X		X	X	X	X	X
		50°C	X	X	X	X	X	X	X	X		X	X	X	X	X
		40°C	X	X	X	X	X	X		X		X	X	X	X	X
		30°C	X	X	X		X	X		X		X	X	X	X	X
		cold	X	X	X		X	X		X		X	X	X	X	X
	Mini Programme	30°C	X	X								X		X	X	
		cold	X	X								X		X	X	
	Delicates Mixed	40°C	X	X	X			X		X		X		X	X	
		30°C	X	X	X			X		X		X		X	X	
		cold	X	X	X			X		X		X		X	X	
	Wool / Hand-wash	40°C	X	X								X		X	X	
		30°C	X	X								X		X	X	
		cold	X	X								X		X	X	
	Shoes	40°C		X	X			X		X				X	X	
		30°C		X	X			X		X				X	X	
		cold		X	X			X		X				X	X	
	Jeans	60°C	X	X	X								X	X	X	
		50°C	X	X	X								X	X	X	
		40°C	X	X	X								X	X	X	
		30°C	X	X	X								X	X	X	
		cold	X	X	X								X	X	X	
	Soak															
	Rinses		X	X						X	X		X	X	X	
	Conditioner		X	X									X	X	X	X
	Drain															
	Spin													X		

4.2.1 Compatibility between Options

		OPTIONS													
		Rinse-hold	Night cycle	Pre-wash	Stains	Short (Daily)	Very short	Economy	Super-rinse	Bleach	Half-load	Easy-iron	Reduced spin speed	No spin	Hygienize
Compatibility with OPTIONS	Rinse-hold			X	X	X	X	X	X	X	X	X	X	X	X
	Night cycle			X	X	X	X	X	X	X	X				X
	Pre-wash	X	X			X	X	X	X		X	X	X	X	
	Stains	X	X			X	X	X	X		X	X	X	X	
	Very short	X	X	X	X				X	X	X	X	X	X	X
	Short (daily)	X	X	X	X				X	X	X	X	X	X	X
	Economy	X	X	X	X				X	X	X	X	X	X	X
	Super-rinse	X	X	X	X	X	X	X		X	X	X	X	X	X
	Bleach	X	X			X	X	X	X		X	X	X	X	
	Half-load	X	X	X	X	X	X	X	X	X		X	X	X	X
	Easy-iron	X	X	X	X	X	X	X	X	X	X		X	X	X
	Reduced spin speed			X	X	X	X	X	X	X	X	X			X
	No spin	X		X	X	X	X	X	X	X	X	X			X
Hygienize	X	X			X	X	X	X		X	X	X	X		
Phases in which selection or modification are possible	Selection	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Pre-wash	X	X		X	X	X	X	X	X	X	X	X	X	X
	Wash	X	X		X	X	X	X	X	X	X	X	X	X	
	Rinses	X											X	X	
	Spin												X	X	

4.3 Description of options

- **Night cycle**

- Eliminates all spin phases and adds **three** rinses in COTTON cycles and **two** rinses in SYNTHETICS cycles.
- Stops the appliance with water in the tub before the final rinse.
- Switches off the buzzer (if configured).
- To drain the water, reset the programme and then select a drain or spin cycle.

- **Pre-wash**

- Adds a pre-wash phase at the start of the cycle with water heating to 30°C (or cold, if selected).
- In COTTON and SYNTHETICS cycles, performs a short spin before passing to the washing phase.
- This option cannot be selected for WOOL and HAND-WASH cycles.

- **Stains**

- Adds a 5-minute motor movement phase after heating to 40°C.
- Ducts water to the pre-wash/stains compartment in order to introduce the special stain-removal product.
- This option cannot be selected for DELICATES, WOOL and HAND-WASH cycles.

- **Short (Daily)**

- Modifies the structure of the washes in the COTTON and SYNTHETICS programmes in order to obtain good washing performance with a very short cycle (optimization for small loads).

- **Very short**

- Modifies the structure of the COTTON, SYNTHETICS and DELICATES programmes in order to obtain short washing times (optimization for small or lightly-soiled loads).
- Reduces the number of rinse cycles (one less).
- Increases the water level in the remaining two rinse cycles.

- **Economy / Energy label**

- Modifies the structure of the COTTON 40-60 and SYNTHETICS 50/60 programmes in order to reduce energy consumption.
- Reduces the washing temperature.
- Increases the duration of the wash phase.

- **Super-rinse**

- Adds **two** rinses in the COTTON, SYNTHETICS and DELICATES cycles.
- Eliminates the intermediate spin cycles, with the exception of the final rinse, which is reduced to 450 rpm.

- **Bleach**

- Ducts water through the bleach compartment at the beginning of the first rinse in COTTON cycles.

- **Half-load**

- Eliminates one rinse in COTTON programmes.

- **Easy-Iron**

- In COTTON programmes:
 - adds **three** rinse cycles
 - eliminates the intermediate spin cycles
 - performs an impulse spin phase
 - adds an "untangling" phase after the spin cycle
- In SYNTHETICS cycles:
 - reduces the heating temperature in 50/60° cycles to 40°C
 - increases the washing time
 - prolongs the cooling phase at the end of the washing phase
 - adds **one** rinse
 - adds an "untangling" phase after the impulse spin cycle

- **Rinse-hold**

- Stops the appliance with water in the tub before the final spin cycle.
- To drain the water, reset the programme and then select a drain or spin cycle.

- **Reduced spin speed**

- Reduces the speed of **all** spins as shown in the table.

Maximum spin speed (rpm)	600	700	800	900	1000	1100	1200	1300	1400	1550
Reduction for COTTON (rpm)	450	450	450	450	500	550	600	650	700	750
Reduction for ALL OTHER CYCLES (rpm)	450	450	450	450	450	450	450	450	450	450

- **Delayed-start time**

- Adds a pause before the start of the programme. The delay time is displayed on the corresponding LEDs.
- To start the cycle immediately after selecting a delayed start:
 - press START/PAUSE, cancel the delay time by pressing the appropriate button, then press START/PAUSE again.

4.3.1 Modifying the spin speed

- Reduces the speed of **all** spin cycles as shown in the table.
- The last position can be used for NO SPIN, RINSE-HOLD or NIGHT-TIME CYCLE.
- If the NO-SPIN option is selected, two rinses are added in the COTTON cycle, and one in the SYNTHETICS cycle.

The tables below list examples of modification of the spin speed.

Button with 4 LEDs									
1 - Max. spin speed	600	700	800	900	1000	1100	1200	1300	1400
2	500	600	700	700	700	700	900	900	900
3	400	500	500	500	500	500	500	500	500
4 – Last position	No spin or Rinse-hold	No spin or Rinse-hold	No spin or Rinse-hold	No spin or Rinse-hold	No spin or Rinse-hold	No spin or Rinse-hold	No spin or Rinse-hold	No spin or Rinse-hold	No spin or Rinse-hold

4.3.2 Buzzer

The buzzer (if featured) is incorporated in the PCB, but functions only if the appropriate configuration code is entered.

- **Exclude buzzer**

The buzzer can be deactivated by pressing a combination of two buttons simultaneously for 5 seconds. This option depends on the configuration; as a result, the buttons may vary according to the model.

If the buzzer is deactivated, the appliance will emit no acoustic signal during selection or at the end of the cycle; however, the alarm signalling system remains operative.

4.4 Modification of rinses according to the options selected

			Number of rinses for the options			
			Normal	Super-rinse	Night cycle Easy-iron No spin	(Night cycle Easy-iron No spin) and Super-rinse
PROGRAMMES	COTTON	Very short	2	4	5	7
		Daily	3	5	6	8
		Eco	3	5	6	8
		Eco	2	4	5	7
		Normal	3	5	6	8
	SYNTHETIC FABRICS	Very short	2	4	3	5
		Daily	3	5	4	6
		Eco	3	5	4	6
		Normal	3	5	4	6
	DELICATES	Very short	2	4	2	4
		Normal	3	5	3	5
	WOOL	Normal	3	3	3	3
	HAND-WASH	Normal	3	3	3	3
	SILK	Normal	3	3	3	3
	JEANS	Normal	5	7	8	10

The half-load option reduces of 1 rinse all cotton programmes except the Very short (Quick)

5 WASHING PROGRAMMES

5.1 Base programmes for Cotton / Linen: cold-30-40-50-60-90° (without options)

Phase	N.	Function	Control	Detergent dispenser	Movement	Notes				
						90	60	40	30	*
Prewash	0	Drain	Time		No Movement	VAE + 2" + 6" pause				
	1	Water fill	P1+Time	PW	-----	P1 + QPW1 (*)				
	2	Cold wash	Time		D55	Refill: P1+ 5 min.				
	3	Water fill	Time	PW	-----	Qpw2(*)				
	4	Heating	Temperature		D55	30°				20°
	5	Maintenance	Time			10 min.				
	6	Drain	Time		-----	VAE +20"				
	7	Spin	Time		C0	4,5 min.				
	8	Drain	Time		-----	20"				
Wash	9	Water fill	P1+Time	W	N55	P1+Qh1(*)				
	10	Cold wash	Water fill			Refill P1+Qw(*)				
			Time			10'				
	11	Heating	Temperature		E55	87°/84	60°	40°	30°	20°
	12	Maintenance	Temperature			60	40	30	20	
			Time			4 min.	10 min.	5 min.	5 min.	5 min.
	13	Heating	Temperature			87°/84	60°	40°	30°	
	14	Maintenance	Time			14 min.	20 min.	35 min.	35 min.	35 min.
	15	Cooling	Time		-----	Qc				
	16	Maintenance	Time		D55	2 min.				
	17	Drain	Time		-----	VAE+14"				
	18	Spin	Movement		C1	5 min.				
	19	Drain	Time		-----	20"				
1st rinse	20	Water fill	P1+Time	PW	No Movement	P1+Qfr 1(*)				
	21	Maintenance	Time		N55	5 min.				
	22	Drain	Level		-----	AB_LEV				
	23	Spin	Movement		C2	5 min.				
	24	Drain	Time		-----	20"				
2nd rinse	25	Water fill	P1+Time	W	N55	P1+Qn2(*)				
	26	Maintenance	Time			5 Min.				
	27	Drain	Level		-----	AB_LEV				
	28	Spin	Movement		C2	5 min.				
	29	Drain	Time		-----	20"				
Last rinse (softener)	30	Water fill	P1+Time	SF	-----	P1+Q3rd(*)				
	31	Maintenance	Time		N55	30"				
	32	Water fill	P1+Time	SF		Qn3(*)				
	33	Maintenance	Time			8 min.				
	34	Drain	Level		-----	AB_LEV+14"				
	35	Spin	Movement		CF_COT	9 min.				
	36	Maintenance	Time		N55	1 min.				

The data are indicative

Notes:

P1 time needed to 1st level water fill

(*) time water fills are changeable and calculated by the electronic on the basis of the delivery rate (see specific table)

T time needed to heat the water at the set temperature

" seconds

' minutes

VAE time needed to drain the water till "empty" position of anti- boiling (safety heater) pressure switch

Movement: in this column are described the drum movements at low speed and during spin. (See paragraph "drum movements")

The times of drain phases with spin cycle are indicative and do not take into consideration the intervention of antiunbalance and antifoam protections.

Detergent

dispenser: in this column is indicated the dispenser that is filled with water

5.2 Cotton / Linen Cycles: 90 Eco, 60 - 40/50 “energy label” (without options)

Phase	N.	Function	Control	Detergent dispenser	Movement	CYCLE		
						90	60	50/40
Prewash	0	Drain			No Movement	VAE + 2" + 6" pause		
	1	Water fill	P1+time	PW	----	P1 + Qpw1 (*)		
	2	Cold wash	Time		D55	Refill: P1+ 5 min.		
	3	Water fill	Time	PW	----	Qpw2(*)		
	4	Heating	Temperature		D55	30°		
	5	Maintenance	Time		D55	10 min.		
	6	Drain	Time		----	VAE +20"		
	7	Spin	Time		C0	4,5 min.		
	8	Drain			----	20"		
Wash	9	Water fill	P1+time	W	N55	P1+Qe		
	10	Cold wash	Water fill			Refill P1+Qwe		
	11	Water fill	P1+time	W		2 min.		
	12	Cold wash	Water fill			Qec		
	13	Heating	Temperature		N55(67°/64°-44°/40°)E55(53°/49°)	67°/64°	53°/49°	44°/40°
	14	Maintenance	Temperature		E55	67°/64°	53°/49°	44°/40°
	15	Maintenance	Time		N55	10 min.	5 min.	40 min.
	16	Heating	Temperature		E55			44°/40°
	17	Maintenance	Time		N55(30 min.) E55(25 /20 min.)	15 min.		
	18	Maintenance	Time		N55	30 min.	25 min.	20 min.
	19	Cooling	Water fill			20 min.		
	20	Drain	Time		D55	Qc		
	21	Spin	Time			2 min.		
	22	Drain	Time		C1	VAE+14"		
						5 min.		
1st rinse	23	Water fill	P1+time	PW	No Movement	P1+Qfr 1(*)		
	24	Maintenance	Time		N55	5 min.		
	25	Drain	Level		----	AB_LEV		
	26	Spin	Movement		C2	5 min.		
	27	Drain	Time		----	20"		
2nd rinse	28	Water fill	P1+time	W	N55	P1+Qn2(*)		
	29	Maintenance	Time			5 Min.		
	30	Drain	Level		----	AB_LEV		
	31	Spin	Movement		C2	5 min.		
	32	Drain	Time		----	20"		
Last rinse (softener)	33	Water fill	P1+time	SF	-----	P1+Q3rd(*)		
	34	Maintenance	Time			30"		
	35	Water fill	P1+time	SF	N55	Qn3e_90_40	Qn3e_60	Qn3e_90_40
	36	Maintenance	Time			8 min.		
	37	Drain	Level		----	AB_LEV+14"		
	38	Spin	Movement		CF_COT	9 min.		
	39	Maintenance	Time		N55	1 min.		

The data are indicative

5.3 Base programmes for Synthetics: cold - 30- 40 – 50 - 60° (without options)

Phase	N.	Function	Control	Detergent dispenser	Movement	CYCLE				
						90	60	40	30	*
Prewash	0	Drain	Time		No Movement	VAE + 2" + 6" pause				
	1	Water fill	P1+Time	PW	----	P1 + Qpw1 (*)				
	2	Cold wash	Time		D55	Refill: P1+ 5 min.				
	3	Water fill	Time	PW	----	Qpw2(*)				
	4	Heating	Temperature		D55	30°				20°
	5	Maintenance	Time			10 min.				
	6	Drain	Time		----	VAE +20"				
	7	Spin	Time		C0	4,5 min.				
Wash	8	Drain	Time		----	20"				
	9	Water fill	P1+time	W	N55	P1+Qsy(*)				
	10	Cold wash	Level			Refill P1+Qy1(*)				
	11	Heating	Time			2'				
	12	Heating	Temperature		E55	40°				
	13	Maintenance	Temperature		N55 (90°/60°) E55(42°/39°-30°-20°)	90°	60°	42°/39°	30°	20°
	14	Heating	Time		E55			42°/39°		20°
	15	Maintenance	Temperature					10 min		10 min
	16	Heating	Time			90°	60°	42°/39°	30°	20°
	17	Maintenance	Temperature			22 min.				
	18	Cooling	Time	W	N55	Qc(*)				
1st rinse	19	Maintenance	Time		D55	2 min.				
	20	Drain	Time			VAE+1 min.				
	21	Drain	Time		----	6"				
	22	Drain	Time							
2nd rinse	23	Water fill	P1+time	PW	E55	P1+Qyr1(*)				
	24	Maintenance	Time			3 min.				
	25	Drain	Level			AB_LEV+1 min.				
	26	Drain	Level		----	6"				
Last rinse (softener)	27	Water fill	P1+time	W	E55	P1+Qyr2(*)				
	28	Maintenance	Time			3 Min.				
	29	Drain	Level			AB_LEV+1 min.				
	30	Drain	Level		----	6"				
	31	Water fill	P1	SF	E55	P1				
	32	Maintenance	Time			30"				
	33	Water fill	P1	SF		Qyr3(*)				
	34	Maintenance	Time			5 min.				
	35	Drain	Level		----	AB_LEV+14"				
	36	Spin	Movement		SYN_CF	4,5 min.				
	37	Maintenance	Time		N55	1 min.				

The data are indicative

5.4 Wool programmes: cold - 30° - 40°

Phase	N.	Function	Control	Detergent dispenser	Movement	CYCLE		
						90	60	50/40
Wash	0	Drain			No Movement	VAE + 2" + 6" pause		
	1	Water fill	P1+time	W	----	P1 + Qw0 (*)		
	2	Cold wash	Time		PWL_1_MOV	Refill: P1+Qw01(*) 1 min.		
	4	Heating	Temperature		PWL_1_MOV	38°/35°	33°/30°	20°/10°
	5	Maintenance	Time		PWL_1_MOV	14 min.		
	6	Drain	Time		----	VAE +20"+14"		
1° & 2° Rinses	7	Water fill	Level	W	No Movement	P1		
	8	Water fill	Level	W	PWL_1_MOV	Qwor1		
	9	Maintenance	Time		PWL_1_MOV	3 min.		
	10	Drain	Level		----	AB_LEV+14"		
Last rinse	11	Water fill	Level	SF	----	P1		
	12	Maintenance	Time		----	30"		
	13	Water fill	Level	SF	PWL_1_MOV	Qwor2(*)		
	14	Maintenance	Time		PWL_1_MOV	5 min.		
	15	Drain	Level		----	AB_LEV+14"		
	16	Spin	Movement		WOOL_CF	3,5 min.		

The data are indicative

5.5 Programmes for Delicate fabrics: cold – 30° - 40° (without options)

Phase	N.	Function	Control	Detergent dispenser	Movement	CYCLE				
						60	50	40	30	*
Prewash	0	Drain	Time		No Movement	VAE + 2" + 6" pause				
	1	Water fill	P1+Time	PW	----	P1 + Qpw1 (*)				
	2	Cold wash	Time		D55	Refill: P1+ 5 min.				
	3	Water fill	Time	PW	----	Qpw2(*)				
	4	Heating	Temperature		D55	30°				20°
	5	Maintenance	Time			3 min.				
Wash	6	Drain	Time		----	VAE +14"				
	9	Water fill	Time	W	D55	Qdw1(*)				
	10	Cold wash	Water fill			Refill P1+Qdw2(*)				
	11	Heating	Temperature			1'				
	12	Maintenance	Temperature			60°	50°	40°	30°	20°
	13	Heating	Temperature			60°	50°	40°	30°	20°
	14	Maintenance	Time			10 min.				
	15	Drain	Time		----	10 min.				
1st rinse	16	Drain	Time		D55	VAE				
	17	Drain	Time		----	1 min.				
	18	Water fill	P1+time	W	D55	6"				
	19	Maintenance	Time			P1+Qrd 1(*)				
2nd rinse	20	Drain	Level		----	5 min.				
	21	Drain	Level		D55	AB_LEV				
	22	Drain	Time		----	1 min.				
	23	Water fill	P1+time	W	D55	6"				
Last rinse (softener)	24	Maintenance	Time			P1+Qrd1(*)				
	25	Drain	Level		----	5 Min.				
	26	Drain	Level		D55	AB_LEV				
	27	Drain	Time		----	1 min.				
	28	Water fill	P1	SF	-----	6"				
	29	Maintenance	Time		D55	P1				
Last rinse (softener)	30	Water fill	P1	SF		30"				
	31	Maintenance	Time		----	Qrd2(*)				
	32	Drain	Level		----	3 min.				
	33	Spin	Movement		DEL_CF	AB_LEV+14"				
	34	Maintenance	Time		N55	3,8 min.				
						1 min.				

The data are indicative

5.6 Hand-wash programmes: cold - 30° - 40°

Phase	N.	Function	Control	Detergent dispenser	Movement	CYCLE		
						90	60	50/40
Wash	0	Drain			No Movement	VAE + 2" + 6" pause		
	1	Water fill	Level	W	----	P1 + Qw0 (*)		
	2	Cold wash	Time		PWL_1_MOV	Refill: P1+Qw01(*) 1 min.		
	4	Heating	Temperature		PWL_4_MOV	38°/35°	33°/30°	20°/10°
	5	Maintenance	Time		PWL_4_MOV	14 min.		
	6	Drain	Time		----	VAE +20"+14"		
1° & 2° Rinses	7	Water fill	Level	W	No Movement	P1		
	8	Water fill	Level	W	PWL_4_MOV	Qwor1		
	9	Maintenance	Time		PWL_4_MOV	3 min.		
	10	Drain	Level		----	AB_LEV+14"		
Last rinse	11	Water fill	Level	SF	----	P1		
	12	Maintenance	Time		----	30"		
	13	Water fill	Level	SF	PWL_4_MOV	Qwor2(*)		
	14	Maintenance	Time		PWL_4_MOV	5 min.		
	15	Drain	Level		----	AB_LEV+14"		
	16	Spin	Movement		WOOL_CF	3,5 min.		

The data are indicative

5.7 JEANS programmes

Phase	N.	Function	Control	Movement	CYCLE	
					60	40
Prewash	0	Drain		No Movement	VAE + 2" + 6" pause	
	1	Water fill	Level	-----	P1 + Qpw1(*)	
	2	Cold wash	Time	D55	Refill: P1+5 min.	
	3	Water fill	Time	-----	Qpw2	
	4	Heating	Temperature	D55	30°	
	5	Maintenance	Time	D55	10 min.	
	6	Drain+ Spin	Time	C0	4,5 min.	
	7	Drain	Time	-----	20"	
Wash	8	Water fill	Level	N55	P1+QhI	
	9	Cold wash	Level		Refill: P1+Qw(*)+10 min.	
	10	Heating	Temperature		60°	40°
	11	Maintenance	Temperature	E55	10 min.	5 min.
	12	Heating	Temperature		60°	40°
	13	Maintenance	Temperature		20 min.	35 min.
	14	Drain	Level+time		AB_LEV+14"	
	15	Drain+ Spin	Time	C1	5 min.	

The data are indicative

5.8 SHOES programmes

Phase	N.	Function	Control	Detergent dispenser	Movement	CYCLE
Wash	0	Drain			No Movement	VAE + 8"
	1	Water fill	Level	PW	-----	P1
	2	Water fill	Level	W	D55	Qdw1
	3	Cold wash	Time		D55	Qdw2+5 min.
	4	Heating	Temperature			PROGRAMMA T°
	5	Maintenance	Temperature			5 min.
	6	Maintenance	Time			15 min.
	7	Drain	Level + time		N55	VAE+20"
1° & 2° Rinse	8	Water fill	Level	PW	D55	P1+Qrd1
	9	Maintenance	Level		D55	Refill P1
	10	Drain	Level+time		-----	VAE+14"
3rd rinse	11	Water fill	Level	SF	No Movement	P1
	12	Maintenance	Level+time		D55	30 sec.
	13	Water fill	Level	SF		Qrd2
	14	Maintenance	Level			P1+3min.
	15	Drain	Level+time		-----	VAE+14"
	16	Spin			WOOL_CF	3,5 min.

The data are indicative

5.9 DUVET programmes

Phase	N.	Function	Control	Detergent dispenser	Movement	CYCLE
Wash	0	Drain			No Movement	VAE + 8"
	1	Water fill	Level	W	----	P1 + Qnt (140)
	2	Cold wash	Time		D55	Refill: P1+5 min.
	4	Heating	Temperature			PROGRAMMA T°
	5	Maintenance	Temperature			5 min.
	6	Maintenance	Time			5 min.
	7	Drain	Level + time		----	VAE+14"
	8	Spin			IMP_BLANKET_II_650	4,3 min.
1st rinse	9	Wait	Time			6"
	10	Water fill	Level	PW	No Movement	P1+Qnt(130)
	11	Maintenance	Level		D55	Refill P1
	12	Drain	Level+time		----	VAE+14"
	13	Spin			IMP_BLANKET_II_650	4,3 min.
2nd rinse	14	Wait	Time			6"
	15	Water fill	Level	PW	No Movement	P1+Qnt(130)
	16	Maintenance	Level+time		D55	P1+Qnt+5min.
	17	Drain	Level+time		----	VAE+14"
	18	Spin			IMP_BLANKET_II_650	4,3 min.
Last rinse	19	Wait	Time			6"
	20	Water fill	Level	SF	----	P1
	21	Maintenance	Time		D55	30"
	22	Water fill	Level	SF		125
	23	Maintenance	Level+time			P1+8 min.
	24	Drain	Level		----	AB_LEV+14"
	25	Spin			IMP_BLANKET_III_650	4,6 min.

The data are indicative

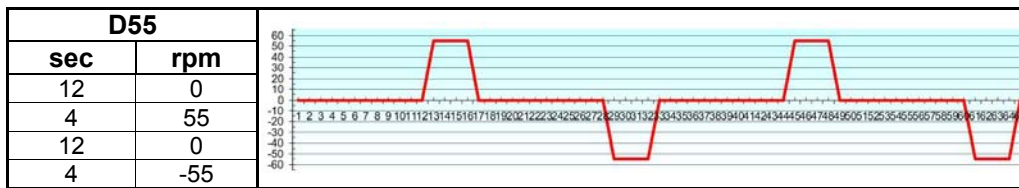
5.10 MINI PROGRAMME

Phase	N.	Function	Control	Detergent dispenser	Movement	CYCLE
Wash	0	Drain			No Movement	VAE + 8"
	1	Water fill	Level	W	D55	Qdw1
	2	Cold wash	Time			Refill: P1+Qdw2
	3	Heating	Temperature			30°/27°
	4	Drain	Level + time			VAE+1 min.
	5	Drain	time		----	6"
1st rinse	6	Water fill	Level	W	D55	P1+Qrd1
	7	Maintenance	Level			5 min.
	8	Drain	Level + time			VAE+1 min.
	9	Drain	time		----	6"
2nd rinse	10	Water fill	Level	W	D55	P1+Qrd1
	11	Maintenance	Time			5 min.
	12	Drain	Level + time			VAE+1 min.
	13	Drain	time		----	6"
Last rinse	14	Water fill	Level	SF	----	P1
	15	Maintenance	Time		D55	30"
	16	Water fill	Level	SF	D55	Qrd2
	17	Maintenance	Time			3 min.
	18	Drain	Level		----	AB_LEV+14"
	19	Spin			CF_DEL	4,5 min.

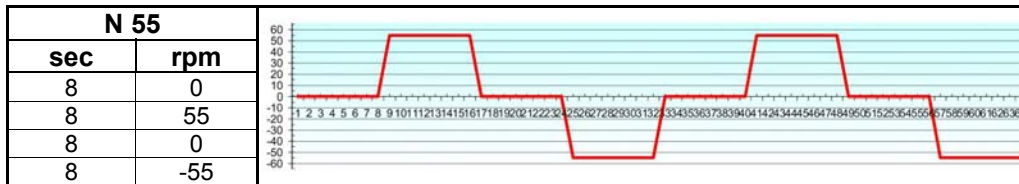
The data are indicative

5.11 Drum movements at low speed and during spin

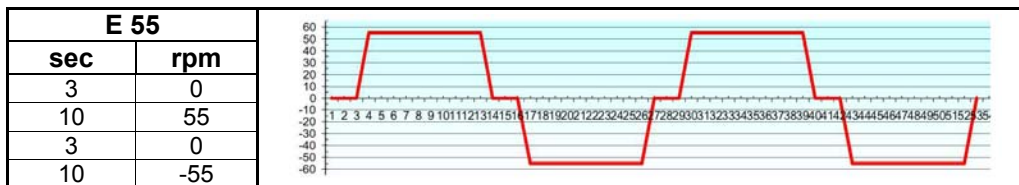
5.11.1 D55 Delicate movement



5.11.2 N55 Normal movement



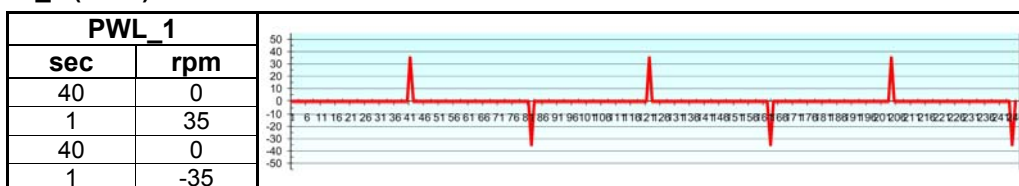
5.11.3 E55 Vigorous movement



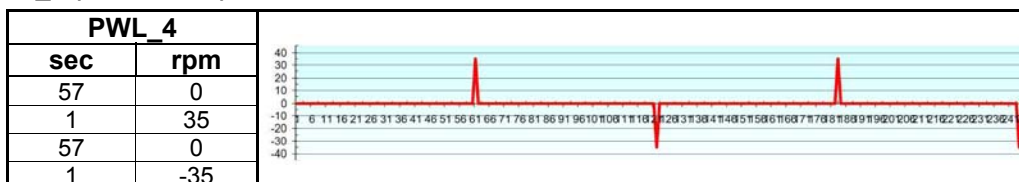
5.11.4 E55 Vigorous movement



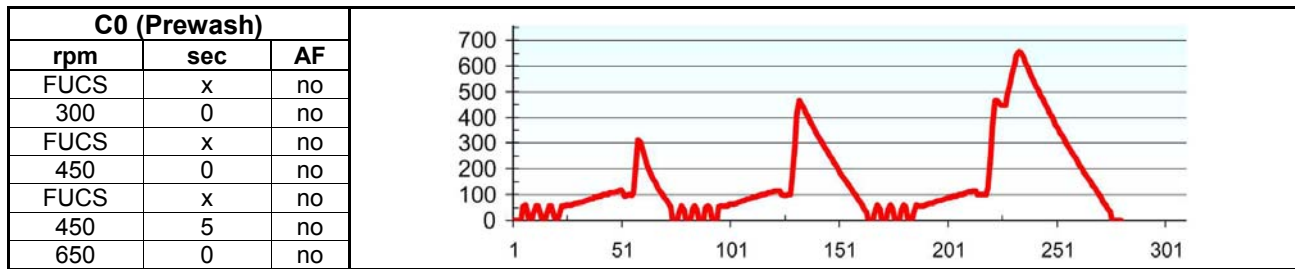
5.11.5 PWL_1 (wool) Delicate movement



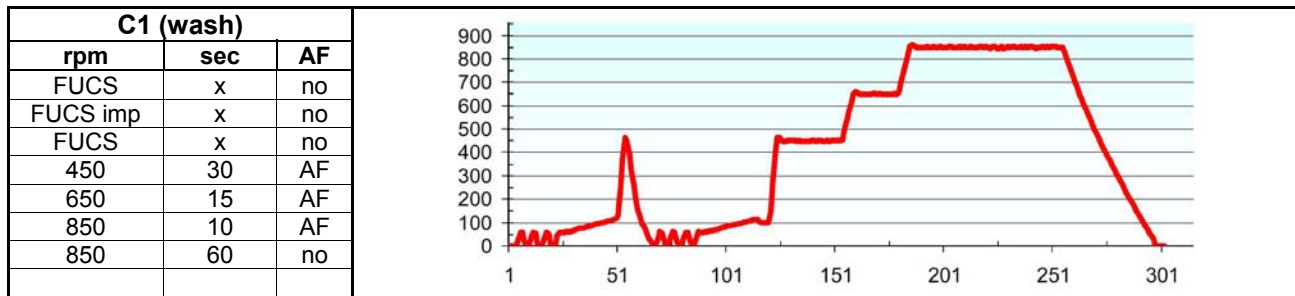
5.11.6 PWL_4 (hand wash) Delicate movement



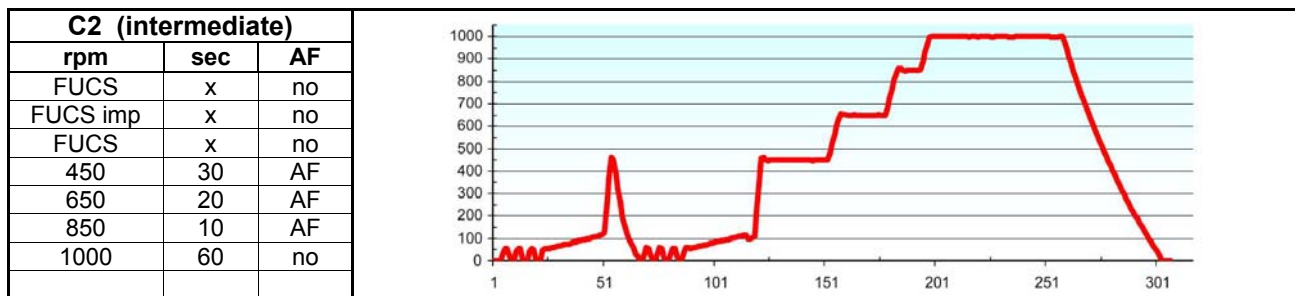
5.11.7 Cotton/Linen, Synthetics – C0 Intermediate Synthetics Prewash Spin



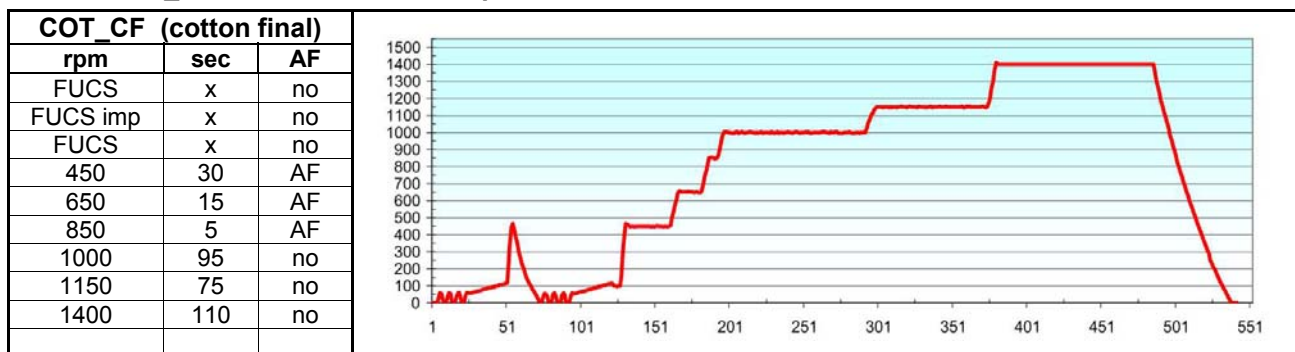
5.11.8 C1 Cotton/Linen Wash Spin



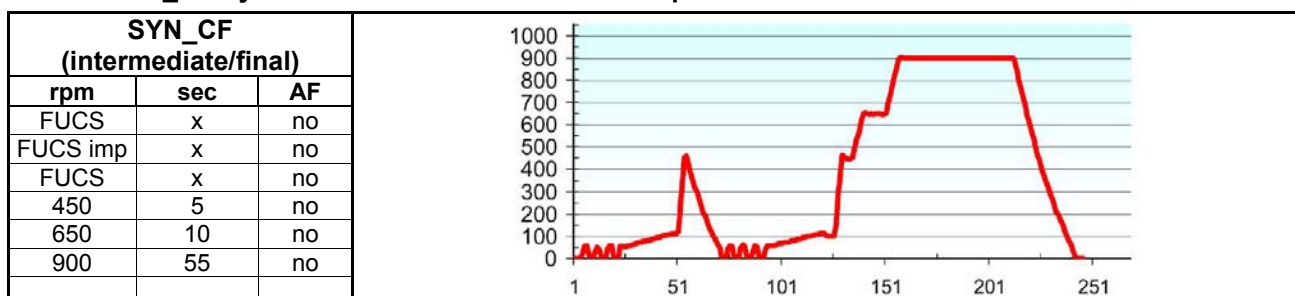
5.11.9 C2 Cotton/Linen Intermediate Spin



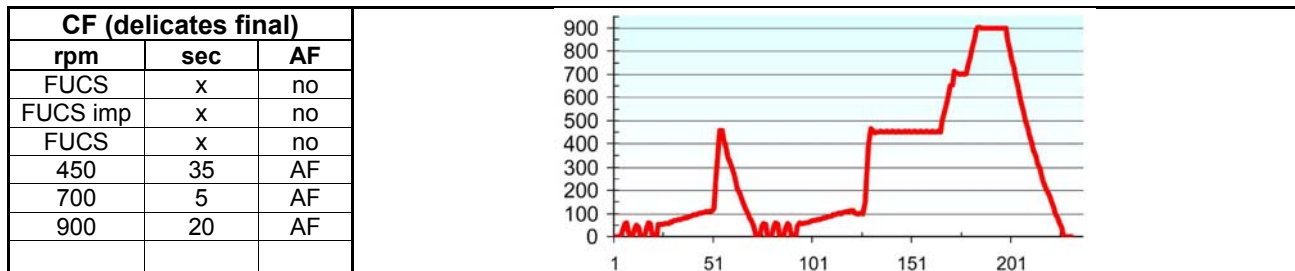
5.11.10 COT_CF Cotton/Linen Final Spin



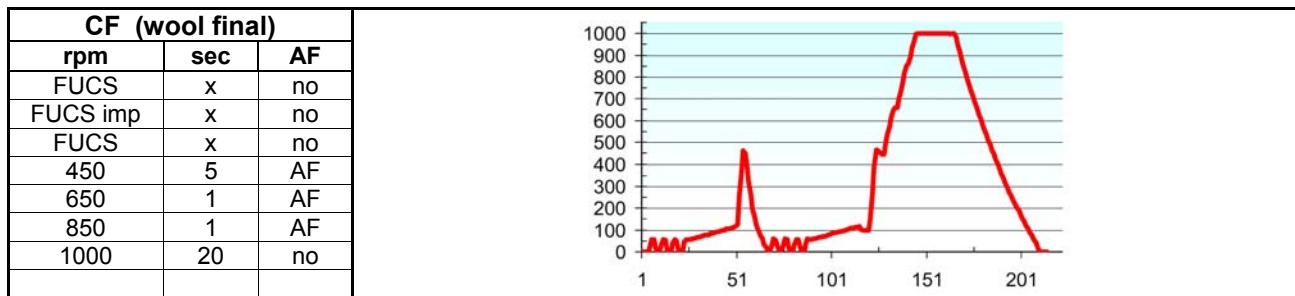
5.11.11 SYN_CF Synthetics Intermediate and Final Spin



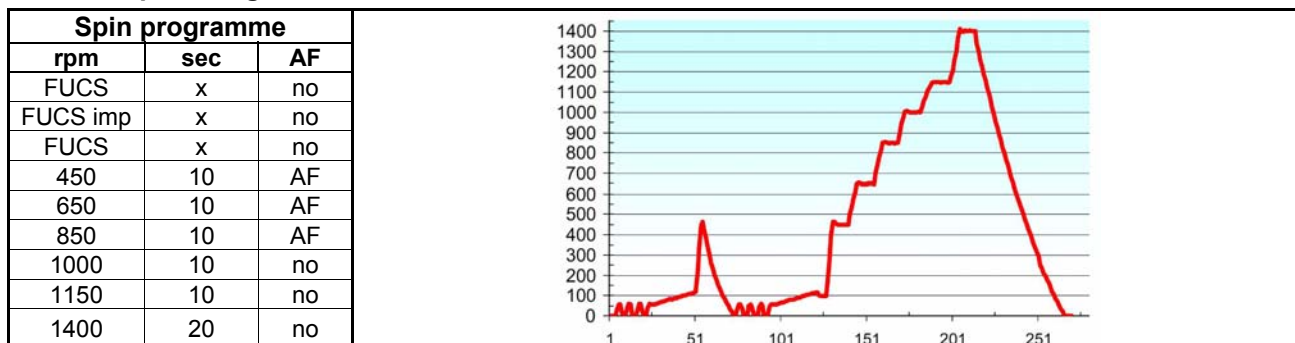
5.11.12 DEL_CF Delicates Final Spin



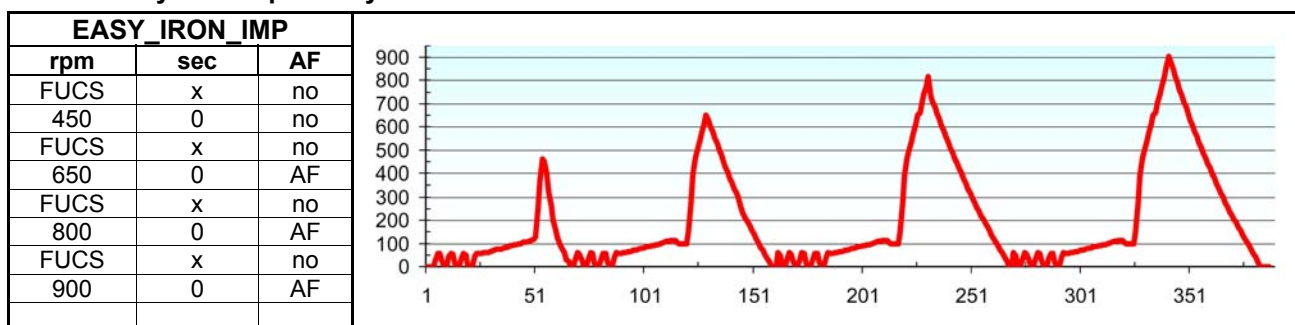
5.11.13 WOOL_CF Hand Wash and Wool Final Spin



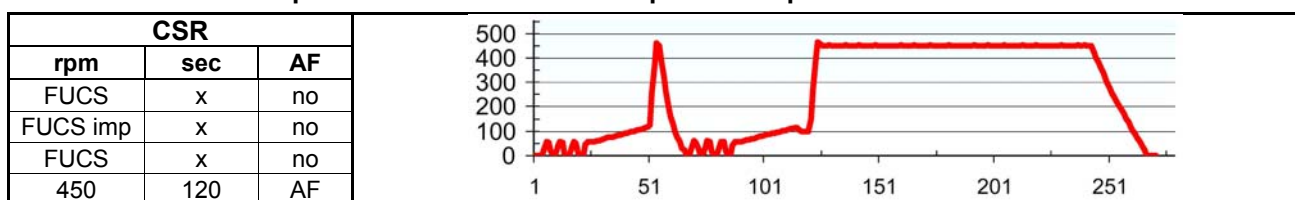
5.11.14 "Spin" Programme



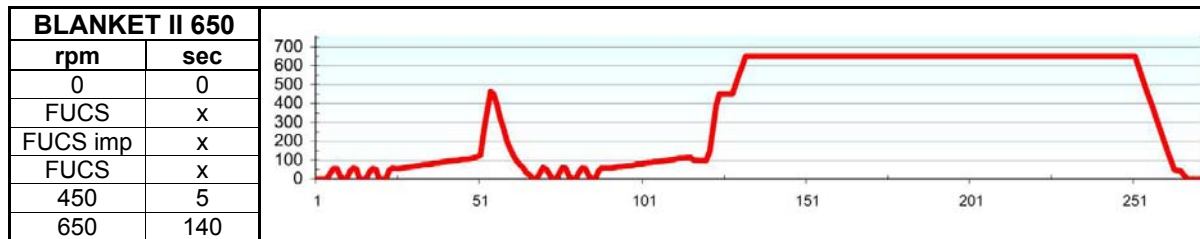
5.11.15 Easy-iron Impulse Cycle



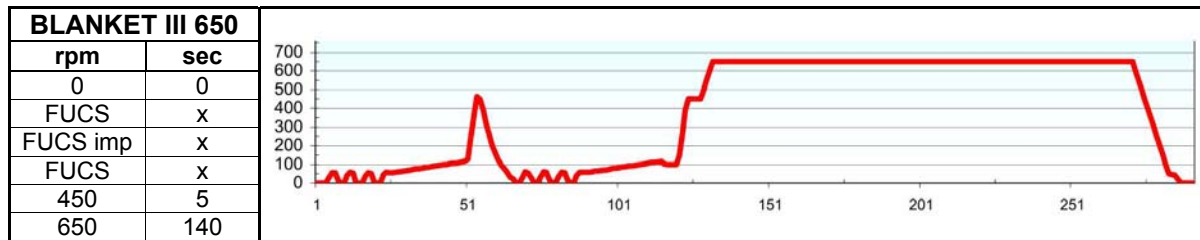
5.11.16 Intermediate Spin for Cotton/Linen with Super-rinse option



5.11.17 Wash and intermediate spin for DUVET



5.11.18 Final spin for DUVET



Notes:

AF indicates if antifoam function is active

FUCS antiunbalance function before spin phase

x variable duration

- In the diagrams the speed is indicated as rotations per minute and the time in seconds.

5.12 Control of water level in tub

The water fill is carried out in two phases:

- **level fill:** is controlled by the closure of 1st level pressure switch in full position
- **time fill:** the duration is calculated by the electronic to fill the set quantity.

The different levels are determined by the model configuration and depend on the type of tub used.

5.12.1 Water fills for models with G20 tub (47 litres drum volume)

PRESSURE SWITCH LEVELS		
Type	Calibration in mm (full-reset)	Quantity of filled water (litres) - Without clothes -
AB Anti-boiling (safety heater)	55 - 35	≅ 3.9
P1 (1 st level)	80 - 55	≅ 6.5

Type	Description of time fill	Litres
Levels for COTTON/LINEN		
Qpw1	First prewash water fill <i>(all cycles)</i>	3.5
Qpw2	Prewash water fill after cold wash <i>(all cycles)</i>	3.5
Qhl	Normal water fill/half load	3.5
Qhl2	Half load water fill for "VERY SHORT" cycle	4.5
Qe	Water fill for "energy label" cycle	4.5
Qwe	Refill for "energy label" cycle if prewash has not been selected	0
Qw	Wash refill if the cycle is not "energy label"	1.5
Qc	Cooling water fill	3.0
Qs	"Stains" compartment water fill	1.5
Qk	Water fill for "quick cycle" rinses	12.5
Qn1	Normal water fill for 1 st rinse	7.5
Qn2	Normal water fill for other rinses	9.0
Qn3	Normal water fill for last rinse	10.0
Qne	Normal water fill for rinse of "energy label" cycle	4.0
Qsr1	Water fill for super-rinse and night cycle if no spin has occurred	5.5
Qsr2	Water fill for super-rinse and night cycle if spin has occurred	6.0
Levels for SYNTHETICS		
Qsy	Wash water fill	1.0
Qsy1	Wash water fill for VERY SHORT cycle	3.5
Qy1	Wash water fill if prewash has not been selected	2.0
Qyr1	Normal water fill for 1 st rinse	8.0
Qyr2	Normal water fill for other rinses	8.0
Qyr3	Normal water fill for last rinse	9.5
Levels for DELICATES		
Qdw1	Wash water fill	8.5
Qdw2	Wash refill	5.0
Qrd1	Normal water fill for 1 st rinse and other rinses	10.0
Qrd2	Normal water fill for last rinse	11.0
Levels for WOOL		
Qwo	Wash water fill	10.0
Qwo1	Wash refill	5.0
Qwor1	Normal water fill for 1 st rinse and other rinses	8.0
Qwor2	Normal water fill for last rinse	8.0
Levels for HAND WASH		
Qwh	Wash water fill	10.0
Qwh1	Wash refill	5.0

The data are indicative

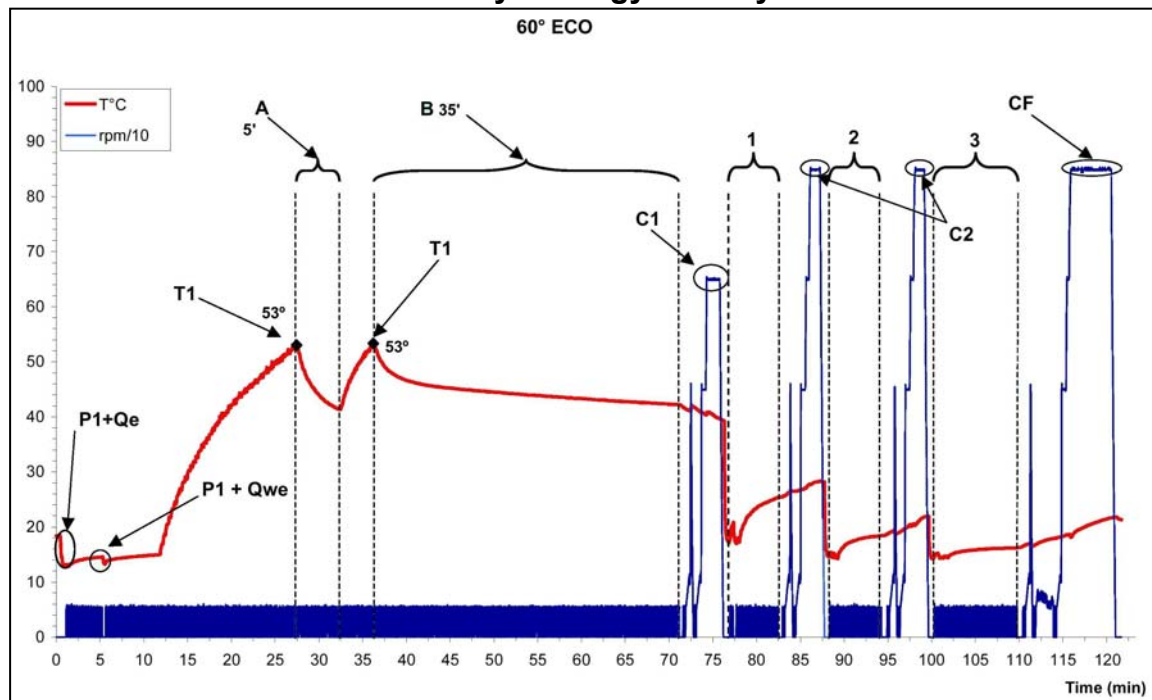
5.12.2 Water fills for models with G19 tub (42 litres drum volume)

PRESSURE SWITCH LEVELS		
Type	Calibration in mm (full-reset)	Quantity of filled water (litres) - Without clothes -
AB Anti-boiling (safety heater)	55 - 35	≅ 3.5
P1 (1 st level)	80 - 55	≅ 5.8

Type	Description of time fill	Litres
Levels for COTTON/LINEN		
Qpw1	First prewash water fill <i>(all cycles)</i>	5.0
Qpw2	Prewash water fill after cold wash <i>(all cycles)</i>	1.0
Qhl	Normal water fill/half load	5.0
Qhl2	Half load water fill for "VERY SHORT" cycle	5.5
Qe	Water fill for "energy label" cycle	2.5
Qwe	Refill for "energy label" cycle if prewash has not been selected	0
Qw	Wash refill if cycle is not "energy label"	1.0
Qc	Cooling water fill	4.0
Qs	"Stains" compartment water fill	1.0
Qk	Water fill for "short cycle"	12.0
Qn1	Normal water fill for 1 st rinse	7.0
Qn2	Normal water fill for other rinses	8.0
Qn3	Normal water fill for last rinse	7.0
Qne	Normal water fill for rinse of "energy label" cycle	4.5
Qsr1	Water fill for super-rinse and night cycle if no spin has occurred	8.0
Qsr2	Water fill for super-rinse and night cycle if spin has occurred	6.0
Levels for SYNTHETICS		
Qsy	Wash water fill	0
Qsy1	Wash water fill for VERY SHORT cycle	1.0
Qy1	Wash water fill if prewash has not been selected	1.0
Qyr1	Normal water fill for 1 st rinse	8.0
Qyr2	Normal water fill for other rinses	8.0
Qyr3	Normal water fill for last rinse	10.0
Levels for DELICATES		
Qdw1	Wash water fill	8.0
Qdw2	Wash refill	0
Qdr1	Normal water fill for 1 st rinse and other rinses	10.0
Qdr2	Normal water fill for last rinse	10.0
Levels for WOOL		
Qwo	Wash water fill	8.0
Qwo1	Wash refill	0
Qwor1	Normal water fill for 1 st rinse and other rinses	10.0
Qwor2	Normal water fill for last rinse	10.0
Levels for HAND WASH		
Qwh	Wash water fill	8.0
Qwh1	Wash refill	10.0

The data are indicative

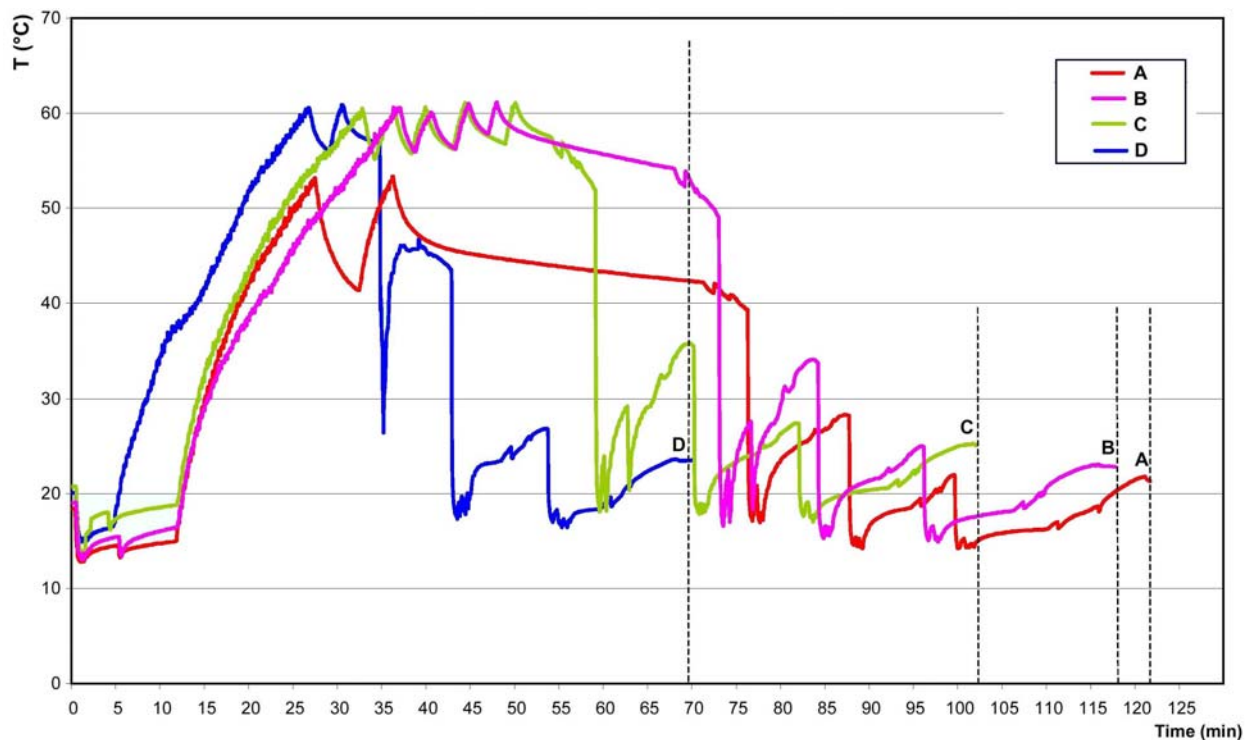
5.13 Profile of COTTON 60 Economy / Energy label cycle



P1+Qe 1st water fill
P1+Qwe Refill water
A Movement for 5 minutes
B Movement for 35 minutes
T1 Heating till 53°C

1 1st rinse
2 2nd rinse
3 3rd rinse
C1 C1 wash spin
C2 C2 intermediate spin
CF CF final spin

5.14 Profiles of COTTON 60° cycles



	Cycle	Water consumption (litres)	Time (min)
A	Economy or "energy label"	52	125
B	Normal (consumer)	56	120
C	Short (Daily)	56	100
D	Very short	49	70

Note: The data are indicative, for the correct values please refer to those of the specific models.

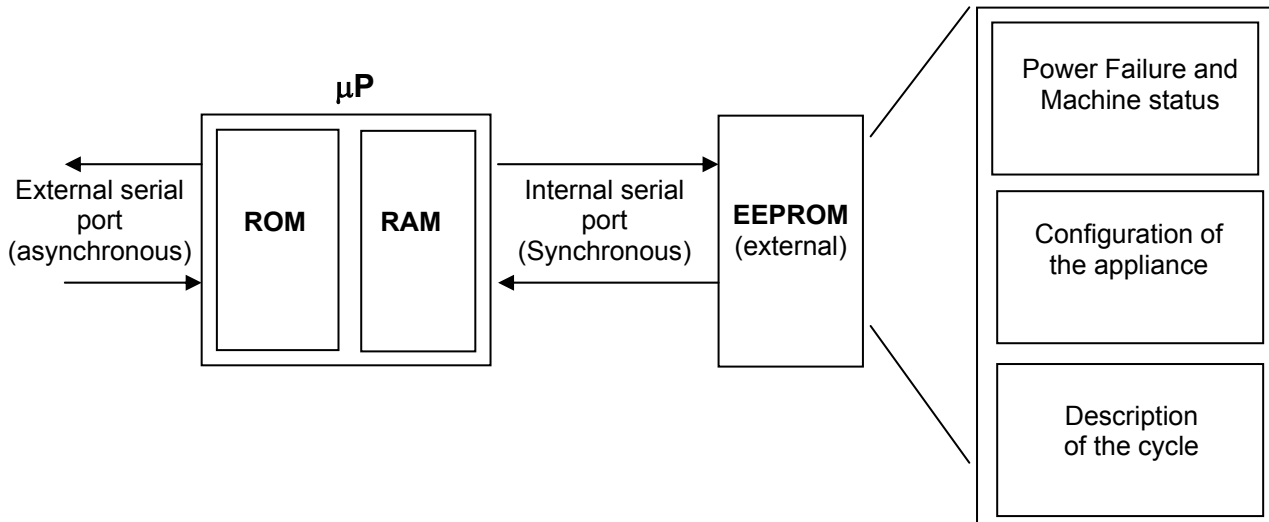
6 TECHNICAL CHARACTERISTICS

6.1 Control system memory



6.1.1 General structure of the memory system

The system features an EEPROM memory module, fitted externally to the microprocessor, which serves to memorize the configuration data, the description of the cycle, the status of the appliance in the event of a power failure, and the alarms.



6.1.2 ROM

The ROM (Read-Only Memory) contains the firmware code relative to the functions of the appliance:

- ⇒ Control of electrical loads (motor, pump, solenoid valves etc.).
- ⇒ Control of the sensors (pressure switches, motor speed, door status etc.).
- ⇒ Control of the user interface
- ⇒ Control of the serial port
- ⇒ Control of power failure procedure and alarms
- ⇒ Execution of the washing programme

In normal production appliances, the ROM cannot be modified.

6.1.3 RAM

The RAM (Random-Access Memory) contains the variables, i.e. all the dynamic information used during execution of the programme:

- ⇒ Motor speed
- ⇒ Water temperature
- ⇒ Alarms
- ⇒ Cycle selected
- ⇒ Machine status

The RAM is cancelled when the power supply is disconnected (power failure or appliance switched off).

The contents of the RAM can be read using a computer connected via a DAAS interface.

The same system can be used to send commands to the electronic control unit such as:

- ⇒ Select remote control mode
- ⇒ Action the various loads in remote mode
- ⇒ Select diagnostics mode
- ⇒ Select a cycle and options, and start the cycle

6.1.4 EEPROM

The EEPROM contains data of various types:

- ⇒ Power failure, i.e. the information necessary to restart the appliance in the event of a power failure:
 - Selected cycle and options
 - Current phase and sub-phase
- ⇒ Machine status, used to perform special cycles such as:
 - Electrical test (used in the assembly line)
 - Continuous cycles (used in the factory workshop)
- ⇒ Machine configuration: the data contained in the EEPROM define the characteristics of the model and are interpreted by the function software. The variables are as follows
 - Type of appliance (front-loader, top-loader, compact)
 - Type of door interlock (PTC or instantaneous)
 - Anti-flooding safety device
 - Transmission ratio between drum pulley and motor pulley
 - Structure of the washing group
 - Power supply frequency (50/60 Hz)
 - Type of PCB (horizontal or vertical buttons)
 - Detergent drawer (3 or 4 compartments)
 - Final spin speed (600 – 1400 rpm)
- ⇒ Identification of the appliance:
 - Prod. N.
 - ELC
 - Serial number
- ⇒ Configuration of the user interface:
 - Programmes on main selector
 - Function of secondary selector (if featured)
 - Number and functions of buttons
 - Functions of the LEDs
 - Operation of the buzzer
- ⇒ Washing cycle tables: Each washing cycle consists of a series of phases (steps); the steps are the basic instructions which comprise the description of the cycle, which is common to all appliances having the same characteristics:
 - Water fill
 - Motor movement
 - Reset
 - Heating
 - Drain
 - Spin
 - "IF" conditions (options, temperatures etc.)
 -
- ⇒ Configuration of the washing cycle: for each family of appliances, certain parameters associated with the washing programme are defined:
 - Operational limits (voltage/frequency)
 - Transmission ratios
 - Parameters for control of the signal from the tachometric generator
 - Parameters for half-range operation of the motor
 - Structure of the washing group
 - Control parameters for the FUCS anti-unbalancing system
 - Water fill control algorithm
 - Alarm control system

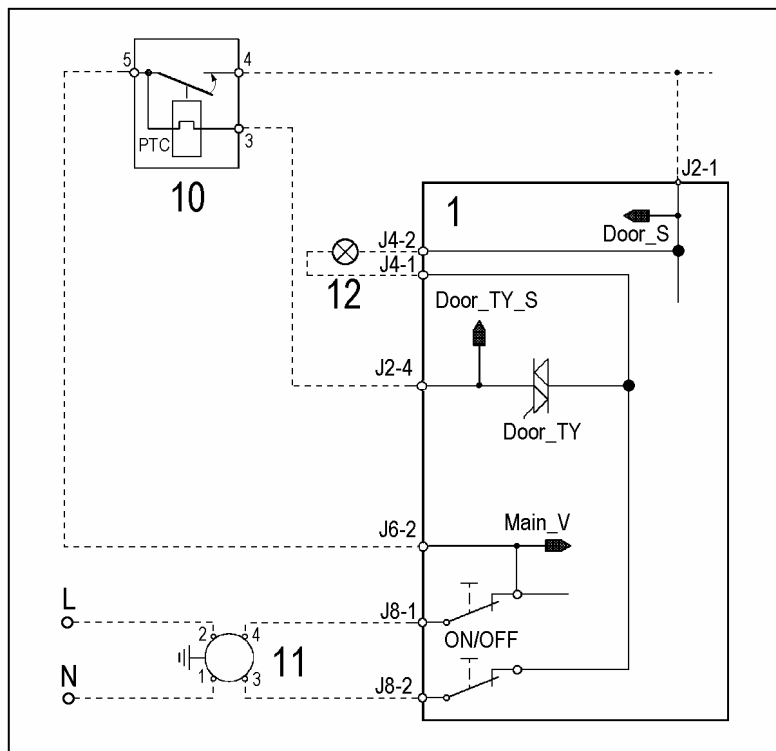
6.2 Door interlock

There are two types of door interlock:

- voltmetric with PTC: it is always necessary to wait from 1 to 3 minutes before opening the door.
- instantaneous: the door can be opened as soon as the cycle ends.

6.3 Voltmetric interlock with PTC

- 1 PCB
10 Door interlock
11 Suppressor
12 "Door locked" pilot lamp
- ON/OFF = Main switch
(Programme selector)



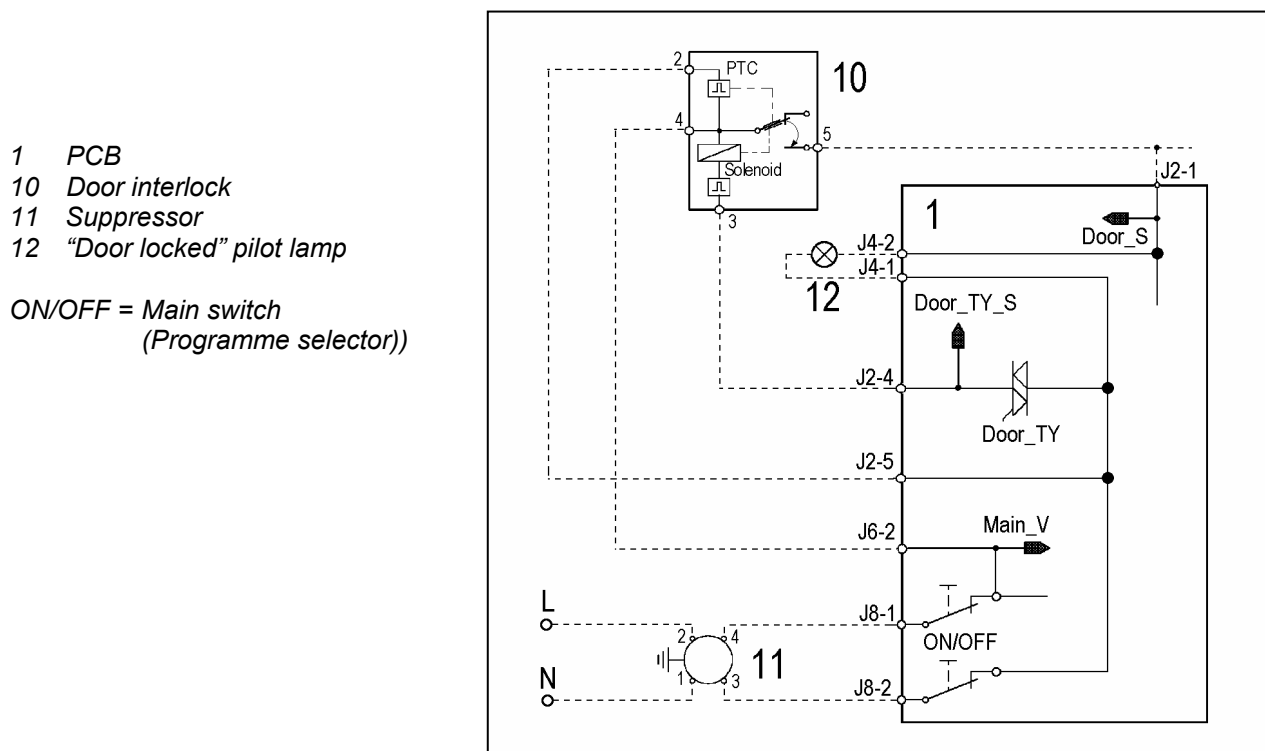
6.3.1 Operating principle

- When the washing programme is started by pressing the START/PAUSE button, the bi-metal PTC (contacts 3-5) is powered by the triac on the PCB: after 2 – 4 seconds, this closes the switch (5-4) which powers the electrical components of the appliance (only if the door is closed).
- The door interlock prevents aperture of the door while the appliance is in operation.
- At the end of the washing programme, the PCB disconnects the interlock from the power supply, but the door remains locked for 1 to 2 minutes (PTC cooling time).

6.3.2 "Door locked" pilot lamp

Certain models feature a pilot lamp which lights to indicate that the door is locked. This pilot lamp switches off when the door can be opened.

6.4 Instantaneous door interlock



6.4.1 Operating principle

- When the appliance is switched on using the programme selector, the ON/OFF switch closes and the bi-metal PTC (contact 4-2) is powered; the door, however, is not locked.
- When the programme starts (START/PAUSE button), the PCB transmits a 20 msec voltage signal to contacts 4-3 of the solenoid valve (at least 6 seconds must elapse after switching on); this signal locks the door and, at the same time, closes the main switch (contacts 4-5) which powers all the components in the appliance.
- At the end of the programme, the PCB transmits two 20 msec signals (at an interval of 200 msec).
 - the first signal does not release the door.
 - the second signal (which is transmitted only if the system functions correctly) releases the door interlock and at the same time the contacts of the main switch are opened.

6.4.2 Conditions necessary for door release

Before transmitting the door release signals, the main PCB checks for the following conditions:

- the drum must be stationary (no signal from the tachometric generator)
- the water level must not be higher than the lower edge of the door
- the temperature of the water must not exceed 40°C

6.4.3 Automatic release device

In the event of a power failure, if the appliance is switched off, or if the solenoid should malfunction, the bi-metal PTC cools over a period of 1 to 4 minutes, and then releases the door.

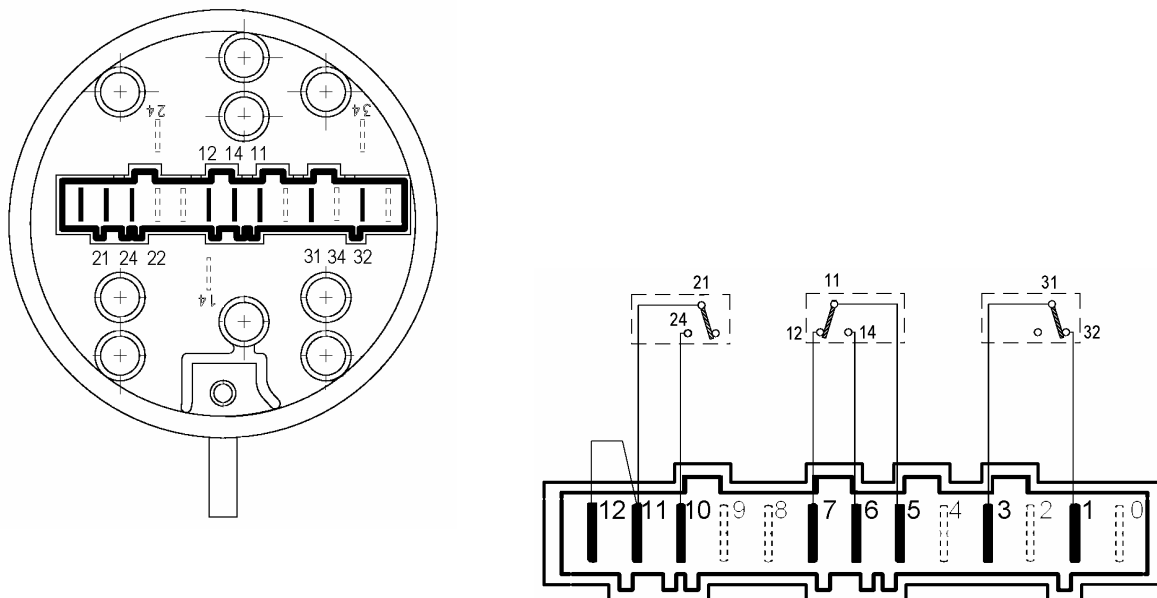
6.4.4 “Door locked” pilot lamp

Certain models feature a pilot lamp which lights to indicate that the door is locked. This pilot lamp switches off when the door can be opened.

6.5 Control pressure switch for water level in the tub

Control of the water level is performed by a three-level pressure switch which functions as follows:

- contact **11-14**: anti-boiling safety level
- contact **21-24**: first level
- contact **31-32**: anti-overflow safety level (*not all models*)



6.5.1 Pressure switch settings

	Full (mm)	Reset (mm)
Anti-boiling level	55± 3	35± 3
1st level	80± 3	55± 3
Anti- overflow level	390± 15	240±50

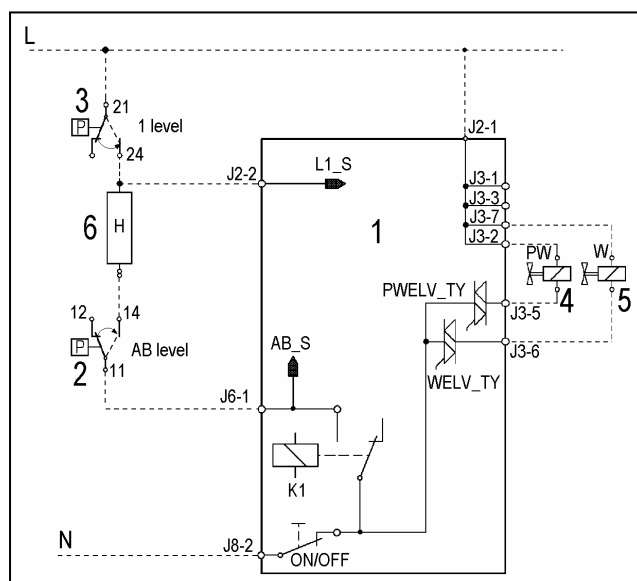
6.5.2 Water fill without wash load

	G20 tub (drum volume 47 l)	G19 tub (drum volume 42 l)
Anti-boiling level (litres)	3,9 (3,5÷4)	3,5 (3,3÷3,8)
1st level (litres)	6,5 (6÷6,7)	5,8 (5,2÷6,3)

6.6 Water fill system

The solenoid valves are powered by the PCB via two triacs. The status of the pressure switch (empty/full) is detected by two “sensing” lines.

1. PCB
2. Anti-boiling level
3. 1st level
4. Pre-wash solenoid
5. Wash solenoid
6. Heating element
- AB_S Anti-boiling level sensor
- L1_S 1st level sensor



6.6.1 Calculation of flow rate

Calculation of the capacity – necessary to determine the time for the supplementary fill – is performed by measuring the time that elapses between the closure of the anti-boiling contact on FULL and the closure of the 1st level contact.

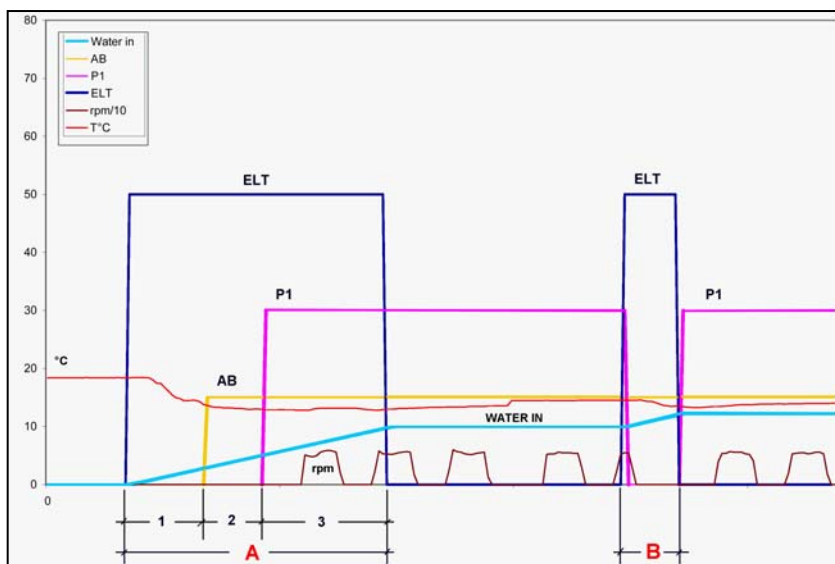
$$\text{Flow rate} = \frac{\text{Volume}}{\text{Time (T1-T2)}}$$

Volume = Volume of the tub between the two levels (anti-boiling and 1st level)

T1 –T2 = The time that elapses between the closure of the anti-boiling and 1st level contacts on FULL.

Water fill diagram

ELT = solenoid valve
P1 = 1st level
AB = anti-boiling level
rpm = drum rotation speed
Water in = water fill



Phase A: The phase during which the initial fill takes place:

1. Water fill until the anti-boiling pressure switch closes on FULL.
2. Water fill until the 1st level pressure switch closes on FULL: the delivery of the solenoid is calculated during this phase.
3. Water fill for time **Q**, which varies according to delivery and cycle phase.

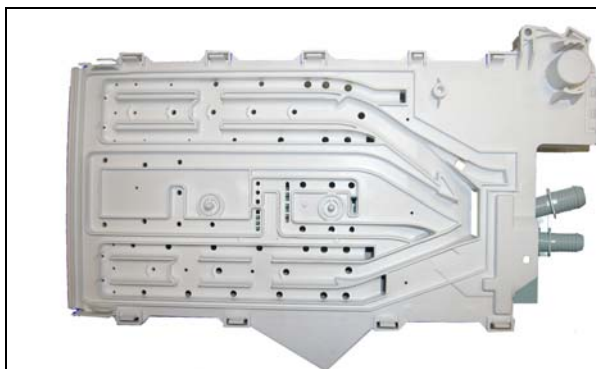
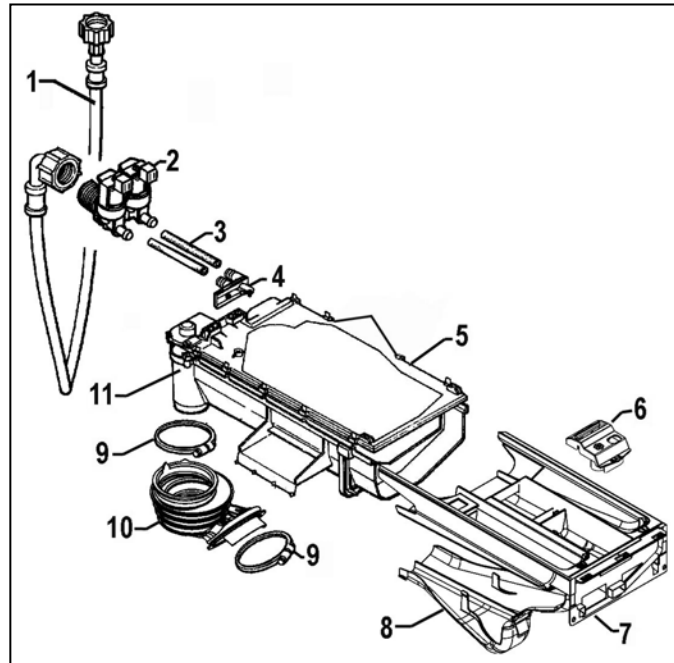
Phase B: If the 1st level pressure switch returns to EMPTY, a supplementary fill is performed until the pressure switch returns to close on FULL. This phase may be followed by a further timer-controlled fill.

6.7 Detergent dispenser

6.7.1 Detergent dispenser with multiple-outlet solenoid valve

The water is ducted into the detergent compartment by a solenoid valve with one inlet and 2 or 3 outlets. The detergent drawer may consist of 3 or 4 compartments.

1. Fill hose
2. Water fill solenoid
3. Tube
4. Dispenser nozzle
5. Dispenser duct
6. Siphon for additives
7. Detergent drawer
8. Drawer lower water duct
9. Clamp
10. Detergent entry tube
11. Detergent dispenser






- Water duct with four compartments
- 2- or 3-way water inlet nozzle
- 3-compartment detergent drawer

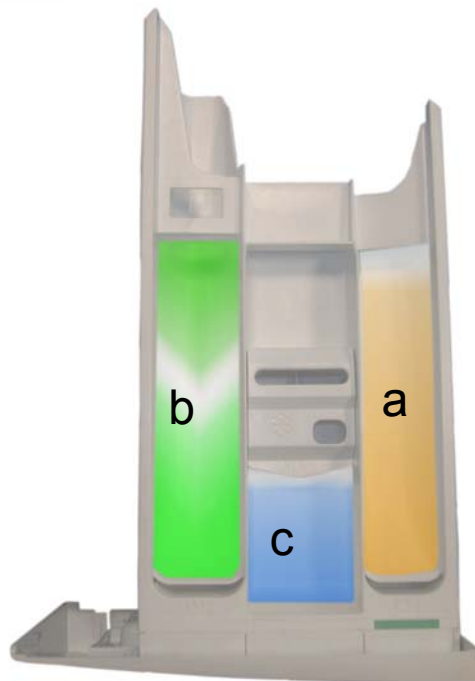


- 2-way solenoid valve

6.7.1.1 Operating principle of 3-compartment water duct

<p>Water fill to pre-wash compartment (Pre-wash solenoid valve)</p> <ul style="list-style-type: none"> This version is used in models with 3-compartment detergent dispensers. The detergent contained in compartment "a" is introduced at the beginning of the pre-wash phase. 	
<p>Water fill to wash compartment (Washing solenoid valve)</p> <ul style="list-style-type: none"> In all models, compartment "b" is used to contain the detergent, which is introduced at the beginning of the wash phase. 	
<p>Water fill to conditioner compartment (pre-wash and wash solenoid valves)</p> <ul style="list-style-type: none"> In all models, compartment "d" is used to contain the conditioner, which is introduced at the beginning of the final rinse. 	

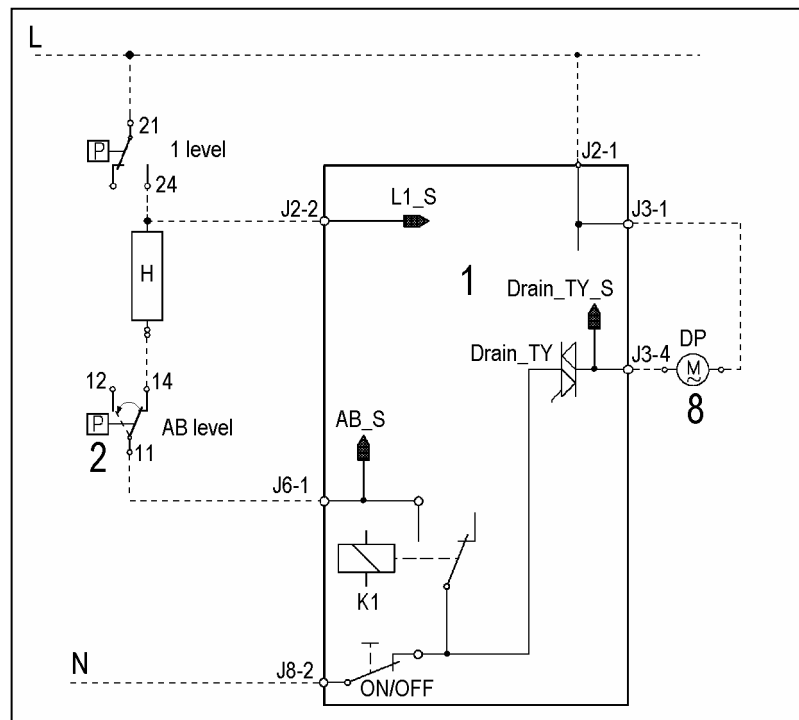
3-compartment drawer



6.8 Drain pump

1. *PCB*
2. *Anti-boiling pressure switch*
8. *Drain pump*

AB_S *Anti-boiling level sensor*



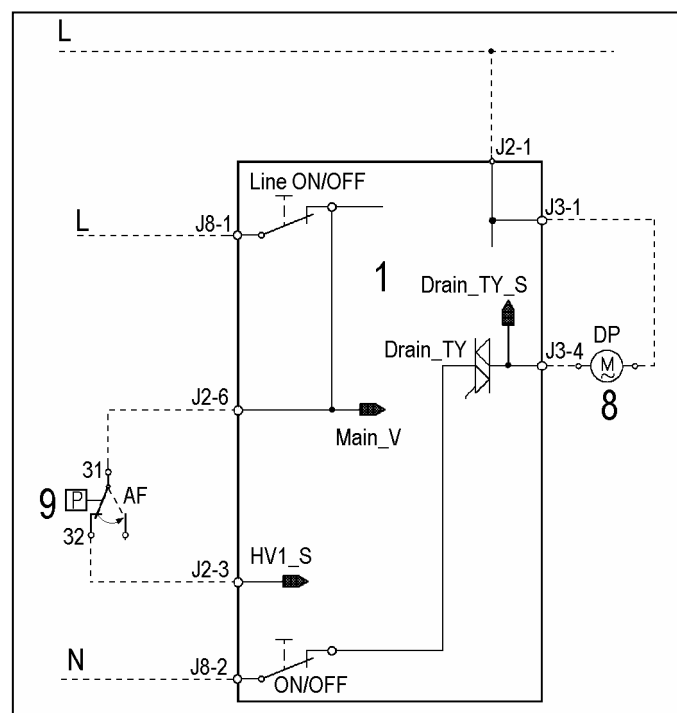
The PCB powers the drain pump via a triac as follows:

- for a pre-determined period
- until the anti-boiling pressure switch closes on EMPTY, after which the pump is actioned for a brief period or passes to the subsequent phase.

6.9 Anti-flooding device

1. PCB
8. Drain pump
9. Anti-overflow pressure switch

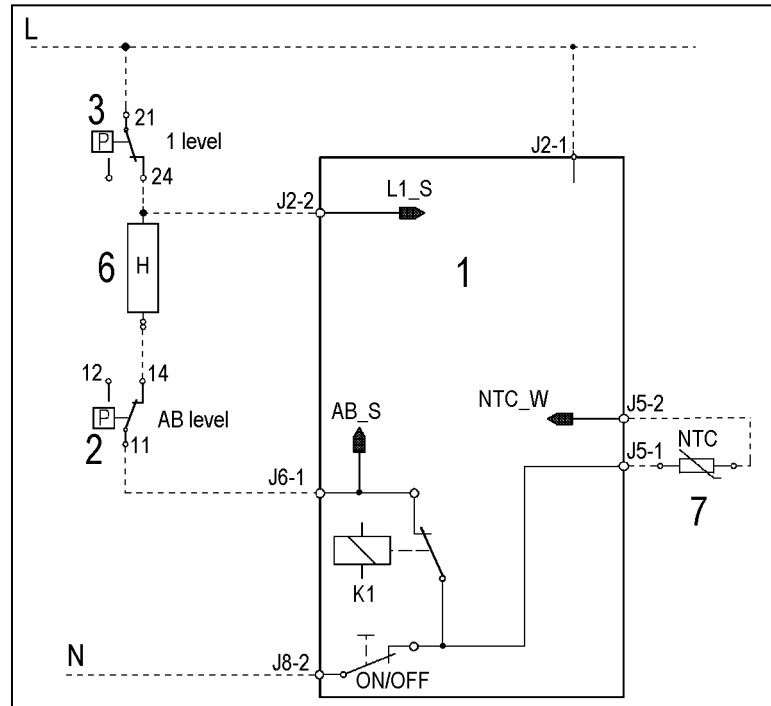
HV1_S Anti-overflow level sensor



The third pressure switch level (if featured) is used as an anti-overflow safety device: if the pressure switch contact should open in the FULL position, the PCB actions the drain pump until the pressure switch returns to the EMPTY position.

6.10 Heating

- 1. PCB
- 2. Anti-boiling pressure switch
- 3. 1st level pressure switch
- 6. Heating element
- 7. NTC temperature sensor
- K1 Relay
- AB_S Anti-boiling level sensor
- L1_S 1st level sensor

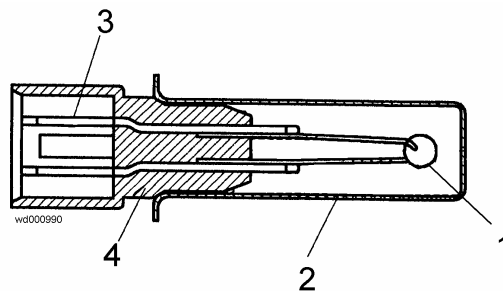


The heating element is powered by a relay on the PCB via the contacts of the pressure switch when closed on FULL.

6.11 Temperature sensor

The temperature is controlled by the PCB by means of a NTC temperature sensor.

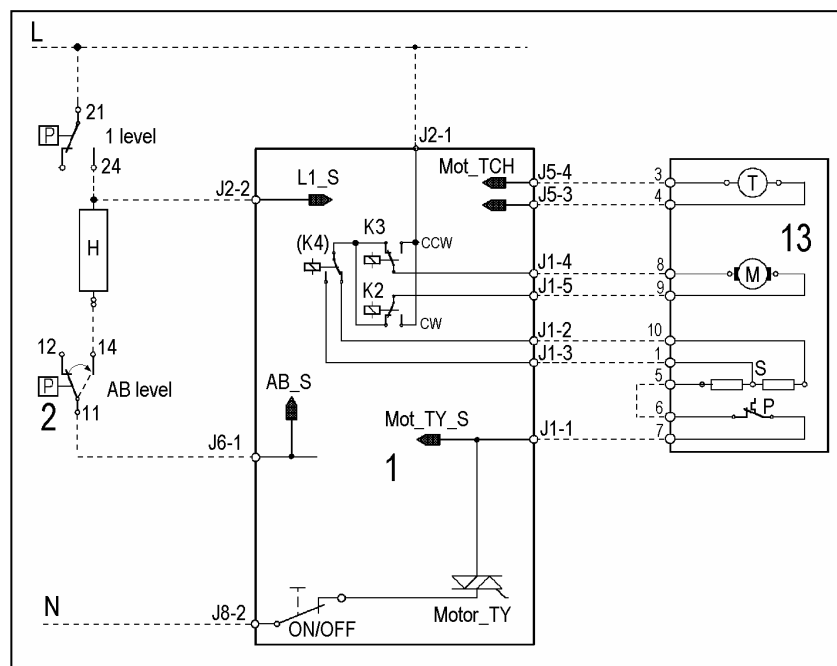
- 1. NTC resistor
- 2. Metallic capsule
- 3. Terminals
- 4. Plastic casing



TEMPERATURE (°C)	RESISTANCE (Ω)		
	Nominal value	Maximum value	Minimum value
20	6050	6335	5765
60	1250	1278	1222
80	640	620	660

6.12 Motor

- 1. PCB
 - 2. Anti-boiling/anti-foam pressure switch
 - 13. Motor
 - M = Rotor
 - P = Motor safety cut-out
 - S = Stator
 - T = Tachometric generator
- AB_S Anti-boiling/anti-foam level sensor



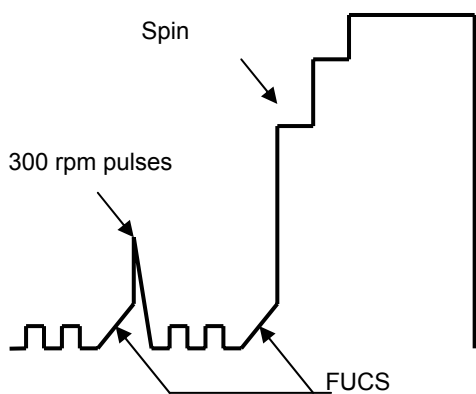
6.13 Power supply to motor

The PCB powers the motor via a triac. The direction of rotation is reversed by switching of the contacts on the two relays (K2-K3), which modify the connection between the rotor and the stator. In certain models, a third relay (K4) is used to power the stator (full or half field) according to the spin speed. The speed of rotation of the motor is determined by the signal received from the tachometric generator. During the spin phases, the microprocessor, depending on the software configuration, may perform the anti-foam control procedure (if featured) and the anti-unbalancing control procedure.

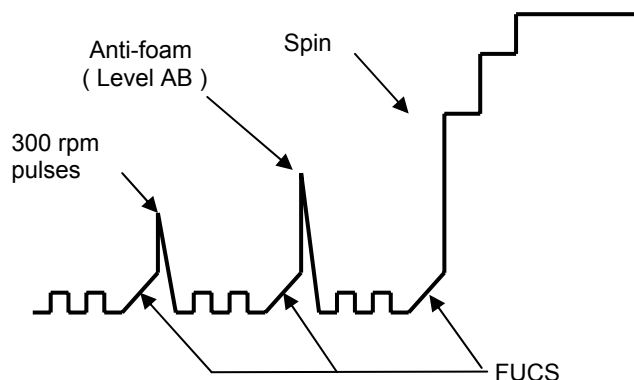
6.14 Anti-foam control system

The anti-foam control procedure (if featured) is performed via the anti-boiling pressure switch (AB).

Spin phase without foam



Spin phase with little foam



- **Spin with little foam:** if the contact of pressure switch AB closes on FULL, the spin phase is interrupted; the drain pump continues to operate and, when the contact returns to EMPTY, the spin phase is resumed.
- **Spin with excessive foam in the tub (critical situation):** The control system detects whether the pressure switch commutates 5 times to FULL. In this case, the spin phase is skipped, and a one-minute drain cycle is performed with the motor switched off; in the case of a washing phase, a supplementary rinse is added.

6.15 “FUCS” (Fast Unbalance Control System)

The control procedure for unbalanced loads is performed dynamically, before each spin cycle, as follows:

- ❑ An initial phase is performed in which the direction of rotation of the drum is alternated at 55 rpm.
- ❑ The phase begins at a speed of 55 rpm; the speed can never fall below this threshold, otherwise the check is repeated.
- ❑ At intervals of 300 ms, the balance is calculated and compared with predetermined limits. If the value is less than the lower limit, the speed of the drum is increased by 2 rpm; if the value is higher, the speed of the drum is reduced by 2 rpm. The reduction in the speed of the drum distributes the washing correctly; this procedure is repeated until the wash load is completely balanced.
- ❑ Correct balancing of the wash load is achieved at a speed of 115 rpm, after which the spin cycle begins.

The Unbalancing Control function takes place in four phases; each phase is characterized by an *unbalancing threshold* and a *time-out* (maximum time).

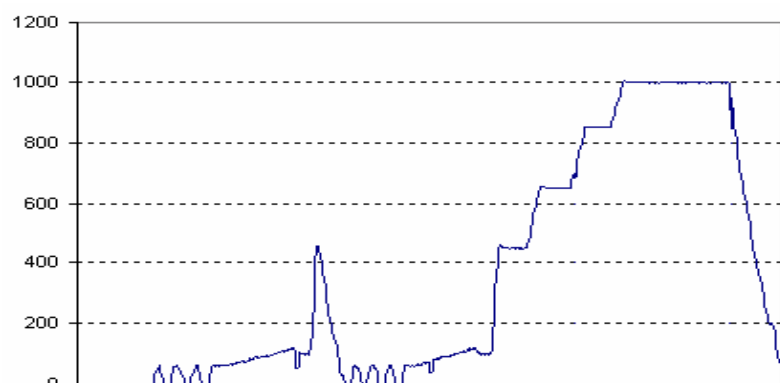
- Phase 0:** Phase 0 has a predetermined unbalancing threshold; if correct balancing of the wash load is achieved, the appliance performs a 470 rpm spin pulse, preceded by 5 seconds at 100 rpm and followed by phase 1; otherwise, after a maximum of 60 seconds, the cycle passes directly to phase 1.
- Phase 1:** The first phase has a different preset unbalancing threshold: if correct balancing is achieved, the appliance performs the spin cycle, preceded by 5 seconds at 100 rpm. If not, after a maximum of 120 seconds, the cycle passes to phase 2.
- Phase 2:** The pre-determined unbalancing threshold in the second phase is different: if correct balancing is not achieved within 60 seconds, the function passes to phase 3.
- Phase 3:** The third phase has a pre-determined unbalancing threshold: if correct balancing is achieved within 90 seconds, a spin pulse is performed, preceded by 5 seconds at 100 rpm and followed by a repeat of phase 1. If the load is highly unbalanced after the second attempt for phase 3, the spin cycle is skipped; if balancing is not perfect, a reduced-speed spin is performed.

6.15.1 Examples of operation of the unbalancing control function

The examples shown below describe the operation of an appliance with a final spin speed of 1000 rpm.

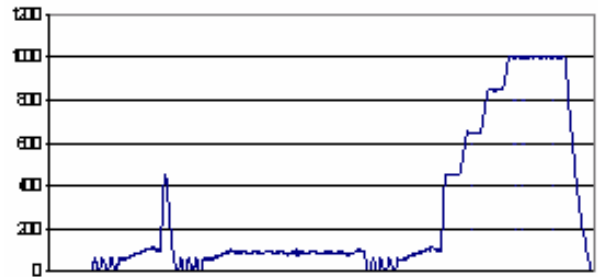
Perfect balancing

- Low speed
- FUCS phase 0 + spin pulse
- Low speed
- FUCS phase 1
- Normal spin



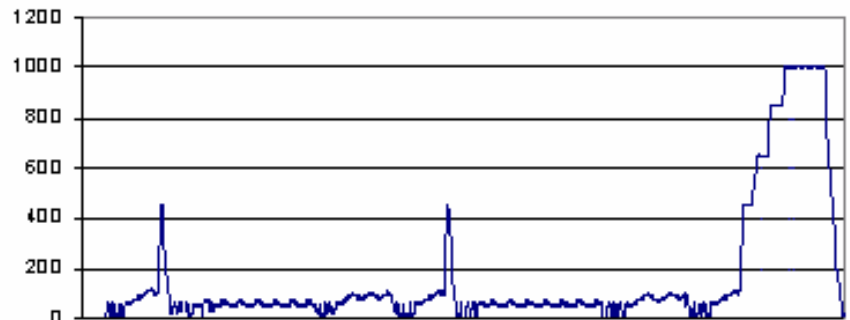
Balancing after two attempts:

- Low speed
- FUCS phase 0
- FUCS phase 1
- FUCS phase 2



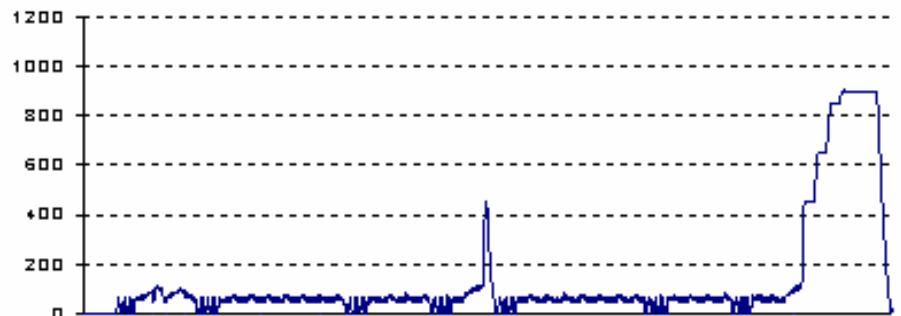
Balancing after the third phase Normal spin

- FUCS phase 0 with spin pulse
- FUCS phase 1
- FUCS phase 2
- FUCS phase 3 with spin pulse
- FUCS phase 1
- FUCS phase 2
- FUCS phase 3
- Normal spin



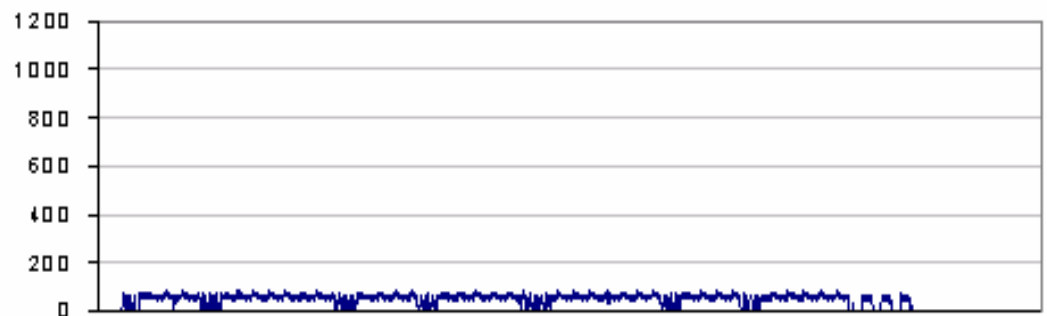
Balancing after the third phase Reduced-speed spin

- FUCS phase 0
- FUCS phase 1
- FUCS phase 2
- FUCS phase 3 with spin pulse
- FUCS phase 1
- FUCS phase 2
- FUCS phase 3
- Reduced-speed spin

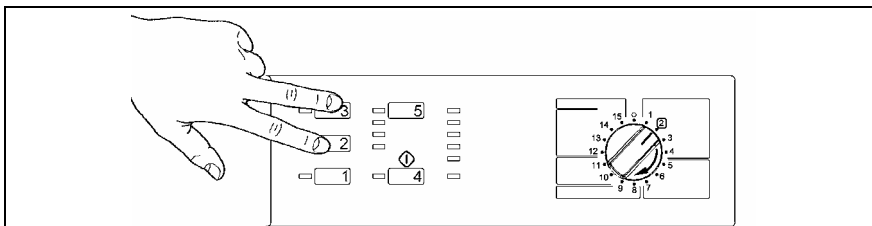


Unbalancing after the third phase:

- FUCS phase 0
- FUCS phase 1
- FUCS phase 2
- FUCS phase 3
- FUCS phase 1
- FUCS phase 2
- FUCS phase 3
- No spin



7 DEMO MODE



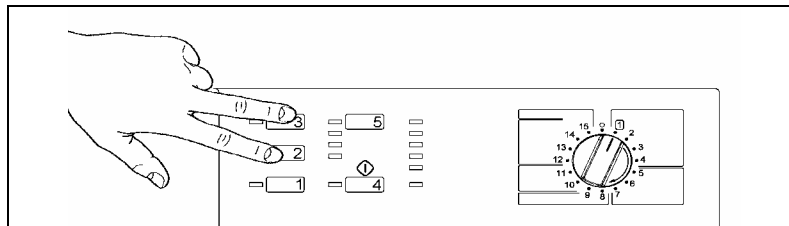
1. Switch off the appliance
2. Press and hold down buttons **2** and **3** simultaneously.
3. Holding down both buttons, switch the appliance on by turning the programme selector **two positions to the right** (clockwise).
4. Continue to hold down buttons **2** and **3** until the LEDs begin to flash (at least 2 seconds).

7.1 Exiting DEMO mode

To exit the demo cycle, switch the appliance off (programme selector in off/cancel position).

8 DIAGNOSTICS SYSTEM

8.1 Access to diagnostics mode



1. Switch off the appliance.
2. Press and hold down buttons **2** and **3** (see picture)
3. Holding down both buttons, switch the appliance on by turning the programme selector **one position to the right** (clockwise).
4. Continue to hold down buttons **2** and **3** until the LEDs begin to flash (at least 2 seconds).

In the first selector position, the operation of the buttons and the relative LEDs is checked; turning the selector knob clockwise activates the diagnostics cycle for the operation of the various components and the alarm reading.

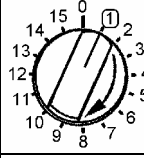
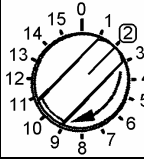
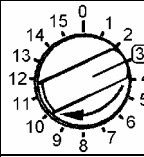
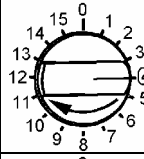
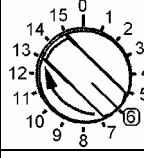
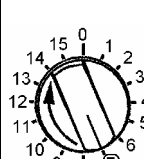
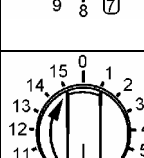
8.2 Exiting diagnostics mode

→ To exit the diagnostics cycle, switch the appliance off, then on, and then off again.

8.3 Diagnostics phases

Irrespective of the type of PCB (i.e. with horizontal or vertical buttons) and the configuration of the programme selector it is possible, after entering diagnostics mode, to perform diagnostics on the operation of the various components and to read the alarms by turning the programme selector **clockwise**.

All the alarms are enabled during the diagnostics cycle.

Selector position	Components actioned	Operating conditions	Function checked
1 	<ul style="list-style-type: none"> - All the LEDs light in sequence - When a button is pressed, the corresponding LED lights (and the buzzer, if featured, sounds) 	Always activated	Operation of the user interface
2 	<ul style="list-style-type: none"> - Door interlock - Washing solenoid 	Door locked Water level below anti-flooding level Maximum time 5 minutes	Water ducted through washing compartment
3 	<ul style="list-style-type: none"> - Door interlock - Pre-wash solenoid 	Door locked Water level below anti-flooding level Maximum time 5 minutes	Water ducted through pre-wash compartment
4 	<ul style="list-style-type: none"> - Door interlock - Pre-wash and wash solenoids 	Door locked Water level below anti-flooding level Maximum time 5 minutes	Water ducted through conditioner compartment
6 	<ul style="list-style-type: none"> - Door interlock - Washing solenoid if the level of water in the tub is below 1st level - Heating element 	Door locked Water level above 1st level Maximum time 10 minutes or up to 90°C (*)	Heating
7 	<ul style="list-style-type: none"> - Door interlock - Washing solenoid if the level of water in the tub is below 1st level - Motor (55 rpm clockwise, 55 rpm counter-clockwise, 250 rpm impulse) 	Door locked Water level above 1st level	Check for leaks from the tub
8 	<ul style="list-style-type: none"> - Door interlock - Drain pump - Motor up to 650 rpm then at maximum spin speed 	Door locked Water level lower than anti-boiling level for spinning	Drain and spin; control of congruence in closure of level pressure switches

(*) In most cases, this time is sufficient to check the heating. However, the time can be increased by repeating the phase without draining the water: pass for a moment to a different phase of the diagnostics cycle and then back to the heating control phase (if the temperature is higher than 80°C, heating does not take place).

9 ALARMS

9.1 User alarm display

Control of the alarm system can be configured; according to the model, therefore, some or all of the alarms may be displayed to the user.

Normally, all alarms are displayed for the used, with the exception of:

- E61 (insufficient heating during the washing phase)
- E83 (error in selector reading)

The alarms are enabled during the execution of the washing programme, with the exception of alarms associated with configuration and the power supply (voltage/frequency), which are also displayed during the programme selection phase.

The door can normally be opened (except where specified) when an alarm condition has occurred on condition that:

- The level of the water in the tub is below 1st level
- The temperature of the water is lower than 40°C.

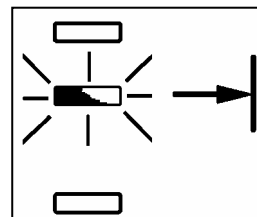
Certain alarm conditions require that a drain phase be performed before the door can be opened:

- Cooling water fill if the temperature is in excess of 60°C.
- Drain until closure of both pressure switch contacts (1st level and anti-boiling safety system) on EMPTY within a maximum of 5 minutes.

9.1.1 Alarms displayed during normal operation

The type of alarm condition is displayed to the user by the repeated flashing of the END OF CYCLE LED (0.4 seconds lit, 0.4 seconds off, with an interval of 2.5 seconds between sequences). This LED is featured on ALL MODELS, though configured in different positions.










All the LEDs flash to indicate a configuration error.



If, for example, the user should forget to close the door, the control system will detect alarm E41 about 15 seconds after the start of the cycle; the cycle remains in PAUSE mode and the LED flashes repeatedly in the sequence shown in the table.

The four flashes indicate the first of the two digits of alarm E41 (the alarms for a given function are grouped in “families”).

In this case, after closing the door, it is sufficient to press START in order to re-start the programme.

END OF CYCLE LED →		
ON / OFF	Time (sec.)	Value
	0.4	1
	0.4	
	0.4	2
	0.4	
	0.4	3
	0.4	
	0.4	4
	0.4	
	2.5	Pause between sequences

9.2 Reading the alarm codes

In order to read the last alarm code memorized in the EEPROM on the PCB:

- Enter diagnostics mode.
- Irrespective of the type of PCB and configuration, turn the programme selector **clockwise** to the **tenth position**.

9.2.1 Displaying the alarm

The alarm is displayed by a repeated flashing sequence of the two LEDs (0.4 seconds lit, 0.4 seconds off, with an interval of 2.5 seconds between sequences). The buzzer (if featured) will sound “bips” in synchronization with the flashing of the LEDs:

- **END OF CYCLE LED** → indicates the first digit of the alarm code (family)
- **START/PAUSE LED** → indicates the second digit of the alarm code (number within the family)

These two LEDs are featured on all models (though they are **configured differently**), and flash simultaneously.

















Notes:

- The first letter of the alarm code “**E**” (Error) is not displayed, since this letter is common to all alarm codes.
- The alarm code “families” are shown in hexadecimal; in other words:
 - **A** is represented by 10 flashes
 - **B** is represented by 11 flashes
 - ...
 - **F** is represented by 15 flashes
- Configuration errors are shown by the flashing of all the LEDs (user interface not configured).

9.2.2 Examples of alarm displays

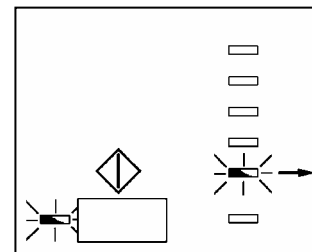
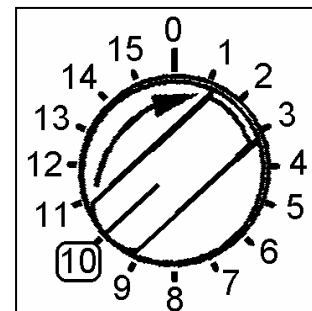
Example: Alarm E43 (problems with the door interlock Triac) will display the following:

- the sequence of four flashes of the END OF CYCLE LED indicates the first number (E43);
- the sequence of three flashes of the START/PAUSE LED indicates the second number E43;

END-OF-CYCLE LED →			START/PAUSE LED ⬇		
ON / OFF	Time (Sec.)	Value	ON / OFF	Time (Sec.)	Value
	0.4	1		0.4	1
	0.4			0.4	
	0.4	2		0.4	2
	0.4			0.4	
	0.4	3		0.4	3
	0.4			0.4	
	0.4	4		3,3	Pause
	0.4				
	2.5	Pause			

9.2.3 Operation of alarms during diagnostics

All alarms are enabled during the components diagnostics phase.



9.3 Rapid reading of alarm codes

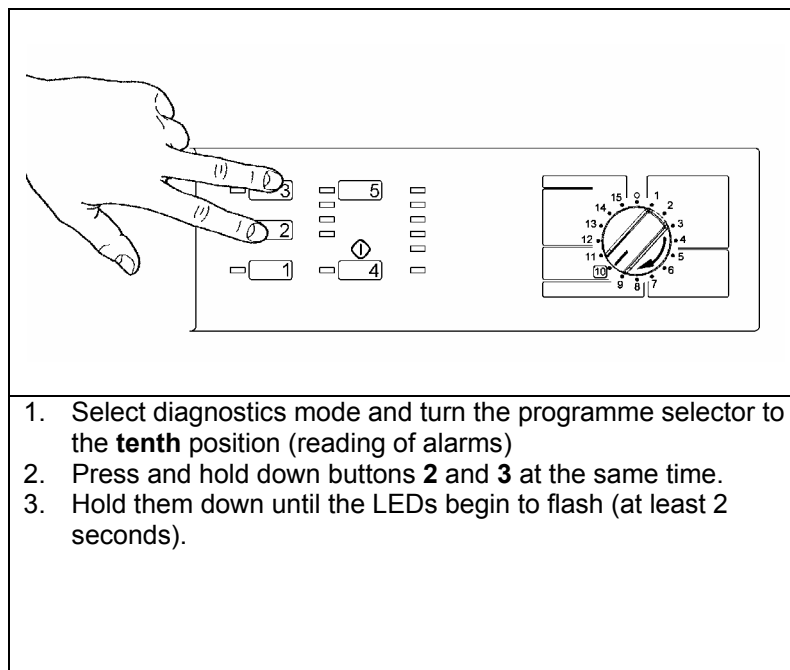
The last alarm code can be displayed even if the programme selector is not in the tenth position (diagnostics) or if the appliance is in normal operating mode (e.g. during the execution of the washing programme):

- Press and hold down **START/PAUSE** and **any of the option buttons** for at least two seconds: the LEDs initially switch off, and then display the flashing sequence corresponding to the alarm.
- The alarm sequence continues as long as the two buttons are held down.
- The alarm reading system is as described in paragraph 8.2.1.
- While the alarms are displayed, the appliance continues to perform the cycle or, if in the programme selection phase, maintains the previously-selected options in memory.

9.4 Cancelling the last alarm

It is good practice to cancel the last alarm:

- after reading the alarm code, to check whether the alarm re-occurs during diagnostics;
- after repairing the appliance, to check whether it re-occurs during testing.



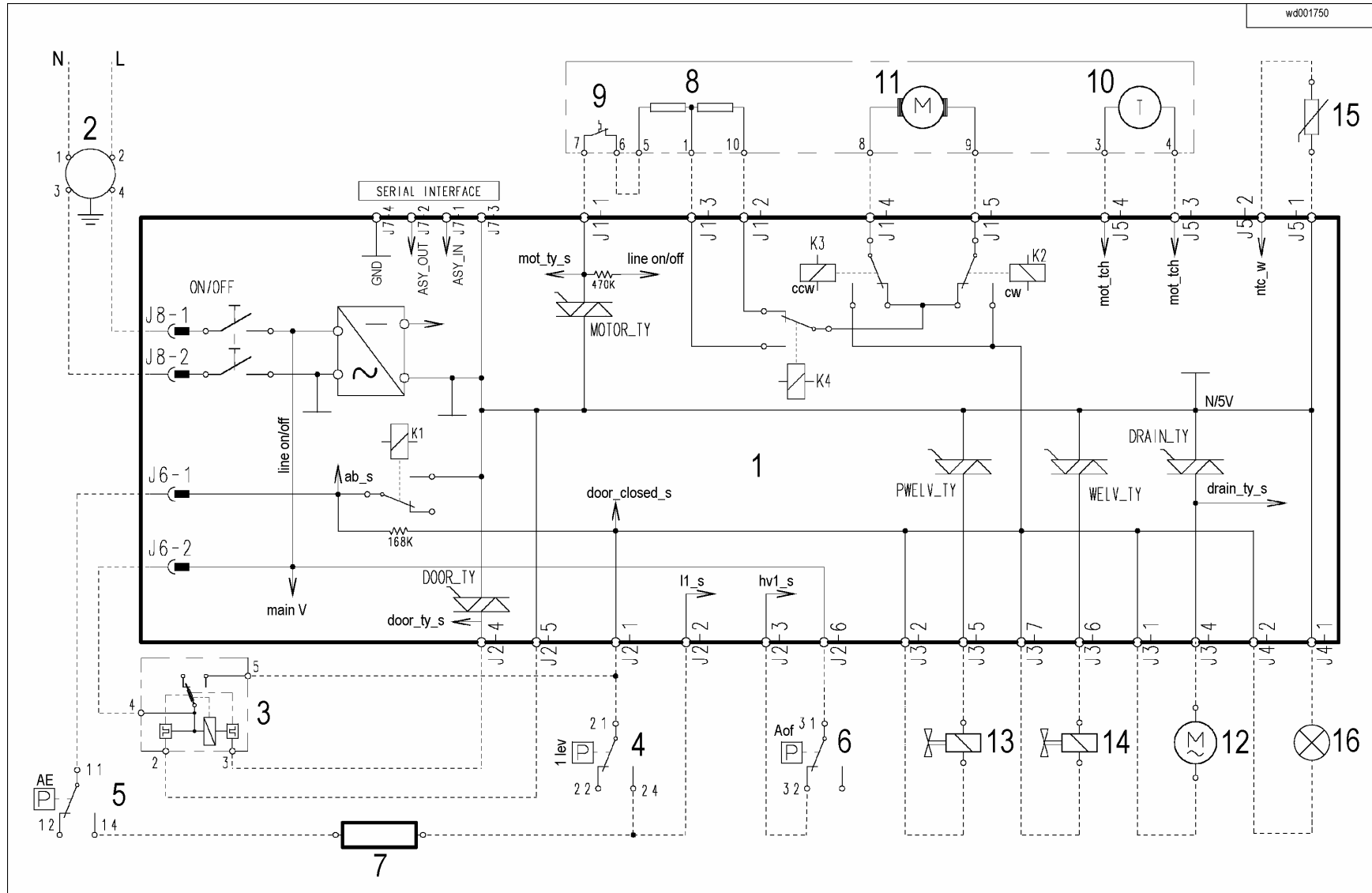
9.5 Table of alarm codes

Alarm	Description	Possible fault	Action/machine status	Reset
E11	Difficulties in water fill for washing	Tap closed or mains pressure insufficient; drain hose incorrectly positioned; water fill solenoid faulty; leaks from the hydraulic circuit of the pressure switch; pressure switch faulty; wiring faulty; PCB faulty.	Cycle paused	Start
E13	Water leakage	Drain hose incorrectly positioned; mains pressure insufficient; water fill solenoid faulty; leakage/blockage of pressure switch hydraulic circuit; pressure switch faulty.	Cycle paused	Start
E21	Difficulties in draining	Drain hose kinked/blocked/incorrectly positioned; drain filter blocked/dirty; drain pump faulty; wiring faulty; PCB faulty; current leakage from heating element to ground.	Cycle paused	Start
E23	Drain pump triac faulty	Drain pump faulty; wiring faulty; PCB faulty.	Safety drain cycle – Cycle stopped with door open	OFF
E24	Fault in “sensing” circuit of drain pump triac	PCB faulty.	Safety drain cycle – Cycle stopped with door released	OFF
E33	Incongruence between closure of anti-boiling and 1st level pressure switch contacts	Pressure switch faulty; current leakage from heating element to ground; heating element; wiring faulty; PCB faulty.	Safety drain cycle – Cycle stopped with door open	OFF
E35	Water overflow (flooding)	Water fill solenoid faulty; leakage from pressure switch hydraulic circuit; pressure switch faulty; wiring faulty; PCB faulty.	Cycle blocked. Safety drain cycle. Drain pump always in operation (5 minutes on, 5 minutes off etc.)	OFF
E36	Fault in “sensing” circuit of anti-boiling pressure switch	PCB faulty.	Cycle blocked, door locked.	OFF
E37	1st level sensing circuit faulty	PCB faulty.	Cycle blocked, door locked.	OFF
E39	“HV” sensor of anti-overflow level faulty	PCB faulty.	Cycle blocked, door locked.	OFF
E41	Door open	Door interlock faulty; wiring faulty; PCB faulty.	Cycle paused	Start
E42	Problems of door closure	Door interlock faulty; wiring faulty; PCB faulty.	Cycle paused	Start
E43	Interlock power supply triac faulty	Door interlock faulty; wiring faulty; PCB faulty.	(Safety drain cycle) Cycle blocked	OFF
E44	Door interlock sensor faulty	PCB faulty.	(Safety drain cycle) Cycle blocked	OFF
E45	Door interlock sensing circuit triac faulty	PCB faulty	(Safety drain cycle) Cycle blocked	OFF
E51	Motor power supply triac short-circuited	PCB faulty; current leakage from motor or from wiring.	Cycle blocked, door locked (after 5 attempts)	OFF
E52	No signal from motor tachometric generator	Motor faulty; wiring faulty; PCB faulty	Cycle blocked, door locked (after 5 attempts)	OFF
E53	Motor triac sensing circuit faulty	PCB faulty.	Cycle blocked, door locked	OFF
E54	Motor relay contacts sticking	PCB faulty; current leakage from motor or from wiring	Cycle blocked, door locked (after 5 attempts)	OFF

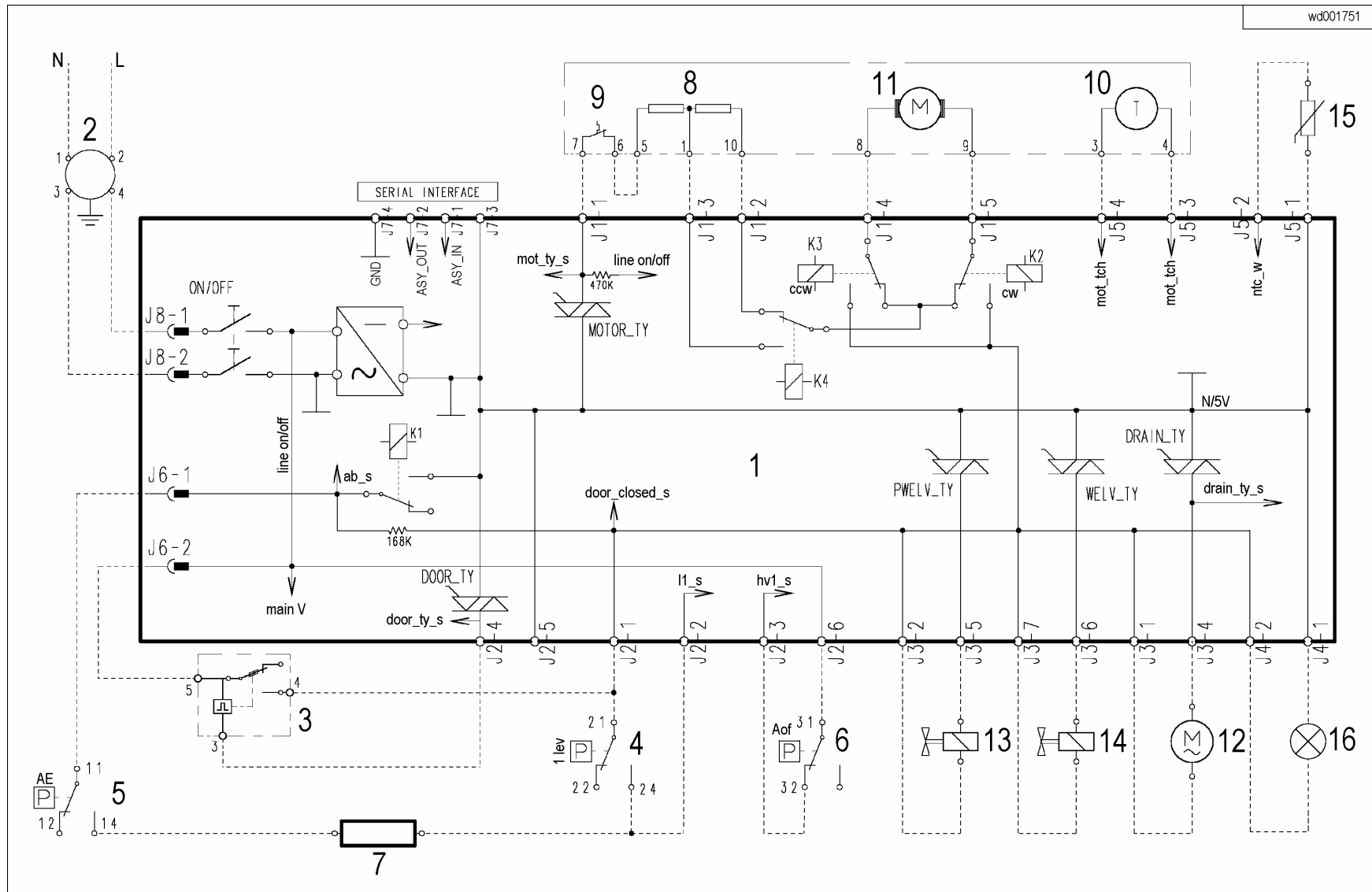
Alarm	Description	Possible fault	Action/machine status	Reset
E61	Insufficient heating during washing	NTC sensor faulty; heating element faulty; wiring faulty; PCB faulty.	The heating phase is skipped	---
E62	Overheating during washing	NTC sensor faulty; heating element faulty; wiring faulty; PCB faulty.	Safety drain cycle – Cycle stopped with door open	OFF
E66	Heating element power relay faulty	PCB faulty; current leakage from heating element to ground.	Safety drain cycle – Cycle stopped with door open	OFF
E71	Washing NTC sensor faulty	NTC sensor faulty; wiring faulty; PCB faulty.	The heating phase is skipped	Start
E82	Error in selector reset position	PCB faulty.	---	OFF
E83	Error in reading selector	Incorrect configuration data; PCB faulty.	Cycle cancelled	---
E93	Incorrect configuration of appliance	Incorrect configuration data; PCB faulty.	Cycle interrupted	OFF
E94	Incorrect configuration of washing cycle	Incorrect configuration data; PCB faulty.	Cycle interrupted	OFF
E95	Communications error between microprocessor and EEPROM	PCB faulty.	Cycle interrupted	OFF
E96	Incongruency between hardware version and configuration	Incorrect configuration data; PCB faulty.	Cycle interrupted	OFF
E97	Incongruency between selector and cycles configuration	Incorrect configuration data; PCB faulty.	Cycle interrupted	OFF
EB1	Frequency of appliance incorrect	Power supply problems (incorrect / disturbance); PCB faulty.	Cycle interrupted	---
EB2	Voltage too high	Power supply problems (incorrect / disturbance); PCB faulty.	Cycle interrupted	---
EB3	Voltage too low	Power supply problems (incorrect / disturbance); PCB faulty.	Cycle interrupted	---

10 BASIC CIRCUIT DIAGRAMS

10.1 Version with instantaneous-aperture interlock



10.2 Version with PTC interlock



10.3 Key to circuit diagram

Components in the appliance	Components of the PCB	
1. Electronic board	DOOR_TY	Interlock triac
2. Suppressor	DRAIN_TY	Drain pump triac
3. Door interlock	K1	Heating element relay
4. 1st level pressure switch	K2	Motor relay (clockwise rotation)
5. Anti-boiling pressure switch	K3	Motor relay (counter-clockwise rotation)
6. Anti-overflow pressure switch (not all models)	K4	Motor relay: half-range power (not all models)
7. Heating element	MOTOR_TY	Motor triac
8. Stator (motor)	ON/OFF	Main switch (on programme selector)
9. Thermal overload cut-out (motor)	PWELW_TY	Pre-wash solenoid triac
10. Tachometric generator (motor)	Serial interface	Asynchronous serial interface
11. Rotor (motor)	WELV_TY	Wash solenoid triac
12. Drain pump		
13. Pre-wash solenoid valve		
14. Wash solenoid valve		
15. NTC temperature sensor		
16. "Door locked" pilot lamp (not all models)		